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21st Annual Session

AMERICAN CONGRESS OF PHYSICAL THERAPY

SEPTEMBER 9, 10, 11, 12, 1942

HOTEL WILLIAM PENN — PITTSBURGH, PA.

Volume XXIII — JULY, 1942 — No. 7

21st Annual Scientific and Clinical Session

AMERICAN CONGRESS of PHYSICAL THERAPY

September 9, 10, 11, 12, 1942

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FUNCTIONAL DISTURBANCES ATTRIBUTABLE TO THE DEVELOPMENT OF THE ERECT POSTURE

FRANCES BAKER, M.D.

Director of Physical Therapy Department, University of California Hospital

SAN FRANCISCO

The importance of maintaining or procuring an erect posture in order to prevent or to assist in the relief of certain pathologic conditions has been increasingly stressed during the past few years. Anatomic or mechanical variations from the normal with their consequent symptoms are recognized much more readily than are the physiologic disturbances insofar as the importance of maintaining correct bodily alinement is concerned. In order to know anything about the effect that development of the erect posture may have on health one must review its evolution and consider the time that has been required to bring about the plantigrade posture and the physiologic adjustments that had to be made because of this change in position.

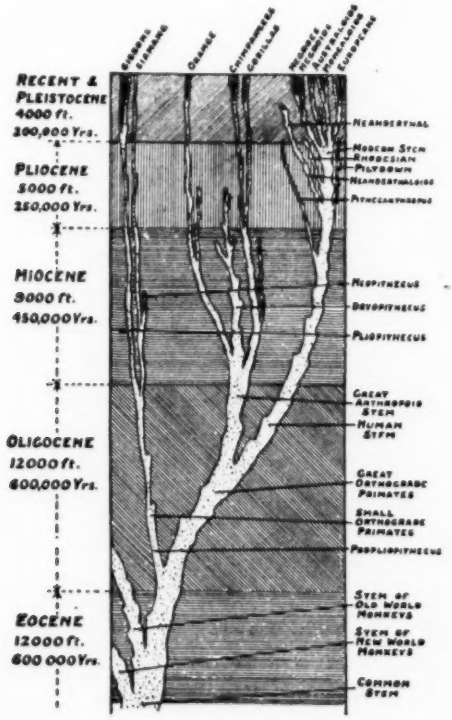

Fig. 1. — Man's Genealogical Tree.

The erect, or plantigrade, posture of man is the result of evolutionary phases. The changes that have occurred to develop the upright position were for postural rather than physiologic reasons. Visceral and physiologic adjustments had to be made as postural changes occurred. The evolutionary phases of the erect posture can be traced in the bodies of the orthograde primates throughout the greater part of the tertiary duration of the earth's history.[1-2] If one studies the genealogical tree (fig. 1) one notes that mon-

keys, small orthograde primates represented by the gibbon, large orthograde primates, including the great anthropoids, and man all arise from a common stem. So the evolution of man's posture is divided into three stages: (1) the gibbon stage, (2) the great anthropoid stage and (3) the plantigrade stage. These stages represent great structural revolutions apparently starting early in the Oligocene period. They do not indicate that man originated from gibbon or anthropoid but rather that man's evolution carried him through stages reached by gibbon and anthropoid and that the third stage carried him on to the present period. The migration of muscles and changes in viscera, nerves, vessels, etc., are the result of a developmental process not yet understood, a growth mechanism probably hormonal in origin.

Fig. 2. — Gibbon.

To the evolutionary stage from which the gibbon (fig. 2) originated man owes the chief of his postural modifications, as it was during this stage that the erect trunk developed. The erect trunk had to be supported on the pelvis, and the loins had to shorten so as to increase their stability by decreasing the leverage necessary to pronograde muscles for leaping. This required sacralization of the seventh lumbar vertebra, and this in turn meant that all the elements lying in the same embryonic segment, nerves, vessels and muscles had to shift; that the buds forming the lower limbs and the nerve centers of the spinal cord had to move forward. The pelvis had to broaden to give greater attachment for the hypertrophying muscles, and further muscular power was added with the disappearance of the tail and the attachment of its erector muscles to the sacrum.

Since the gibbon uses his forelimbs to catch the branches of trees and to support and transport his body, the thorax became compressed between the pectoral group of muscles anteriorly and the trapezius, rhomboid and latissimus dorsi muscles posteriorly. The pectoralis major then took origin not only from the sternum but from the clavicle and ribs as well. The sternum became flattened and united owing to the greater stress of the pectoralis muscle on it as the arms supported the body. The latissimus dorsi kept its origin from the spinous processes of the vertebrae and added a fascial origin from the iliac crest and a muscular origin from the third or fourth lower rib on each side. The serratus magnus muscle increased the lateral convexity of the ribs and so increased the lateral diameter of the chest. The shoulders were drawn outward and backward to form the broad-shouldered figure of all orthograde primates.

The straight abdominal muscles, which are attached to the whole length of the sternum and first ribs in the pronograde monkeys, came to attach themselves with the oblique muscles to the fifth, sixth and seventh costal cartilages. The diaphragm, which is oblique in the pronogrades, obtained its central tendon in the gibbon, the domes became nearly horizontal and the crucial fibers shifted over the sheaths of the psoas and quadratus lumborum muscles. Instead of the apex of the heart merely touching the diaphragm, heart and diaphragm became more closely bound in the gibbon, and the azygos lobe of the right lung and of the subcardiac sinus became compressed. This binding down of the heart to the diaphragm resulted in the increased development of the apical region of the lungs, since this part of the lungs can be aerated only if the roots of the lungs take part in the respiratory movements of the diaphragm. Later, in the anthropoids, the central tendon of the diaphragm became fixed to the roots of the lungs through the pericardium. Many other changes, which need not be considered here, occurred in the thorax at this time, secondary to orthograde posture.

In like manner, changes occurred in the abdominal cavity. Peritoneal adhesions developed to hold organs in their correct positions. The spleen, the cardiac and pyloric ends of the stomach, the duodenum and the colic flexures became sealed into place. Here again are the results of a growth substance probably inherent in the embryonic cells. The abdominal musculature, though really the antagonist of the diaphragm, was forced to take up the support of the viscera, and with the shortening of the loins and the evolution toward the plantigrade, or human position, the intra-abdominal pressure increased and the compression of the abdominal viscera reached its highest point. So the abdominal muscles took on the increasing burden of supporting the organs, while they still had to move downward with the thrust of the diaphragm in respiration.

Fig. 3. — Chimpanzee.

Fig. 4. — Gorilla.

In the second great evolutionary stage, represented by the anthropoids (fig. 1), represented today by orang-outang, chimpanzee and gorilla (figs. 3 and 4), there occurred for the most part only developmental improvement over the changes found in the gibbon. There was a great increase in weight, probably resulting from glandular changes. This forced the anthropoid to a more nearly terrestrial habitation. The musculature of the chest and shoul-

ders required to support the increased weight on the arms developed tremendously. The fifth and sixth and the sixth and seventh costal cartilages became articulated by down growing heels so that the power of the diaphragm became extended from the lower six ribs, to which it is attached through these articulations, to the sternum, which could then be raised in pure thoracic breathing. Within the cavity of the chest, the heart was more firmly bound to the diaphragm, and through the pericardium, the diaphragm was bound to the roots of the lungs. These modifications caused further development of the apexes of the lungs as thoracic breathing increased. To support the weight of the trunk the lumbar portion of the spine was reduced to four or five vertebrae by further sacralization, and the pelvis continued to broaden to permit better muscular attachment.

The third, or plantigrade stage, probably originated at the beginning of the Miocene or late in the Oligocene period (fig. 1), when the line leading to man branched off from the anthropoid stock and the plantigrade posture evolved. In this stage structural changes were confined almost entirely to the lower extremities. The knees and thighs extended and straightened until the lower limbs came to appear as if they were a downward continuation of the trunk (fig. 5). The pelvis, or fulcrum of the lower limbs (fig. 6),

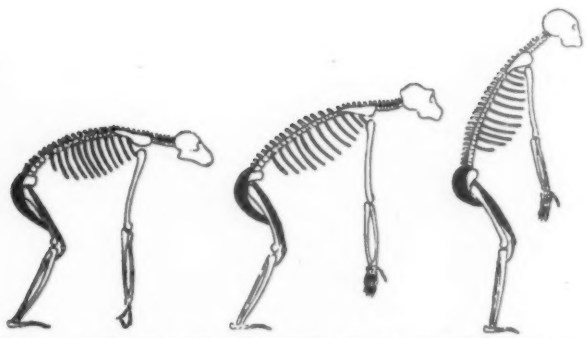

Fig. 5. — Muscular shifts in the extension and straightening of the knees and thighs.

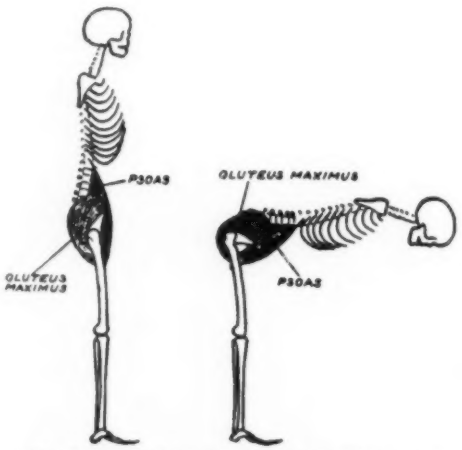

Fig. 6. — Development of anteroposterior curves in the erect position.

tilted downward anteriorly, causing the formation of the lumbar curve, which was followed in turn by the compensatory dorsal and cervical curves. With the extension of the knee and hip, the foot was transformed, the first metatarsal bone approximated the second and the tibialis muscles lifted the longitudinal arch, an action seen only in man. In the gibbon and antropoids the weight of the body is only momentarily transferred through the lumbar region to the lower limbs, whereas in man this is constant. Man, therefore, needs an increasing lever, and so there is a tendency for sacralization to extend caudad again rather than cephalad, as in the other orthograde primates.

The fossil remains (fig. 1) of early man indicate that the lower limbs took on their present form very early, the femur of Pithecanthropus erectus being little different from that of man today, but the balancing of the head on the neck as the cervical portion of the spine developed its compensatory curve was more recent and occurred after the beginning of the Pleistocene period. The shoulders and arm are suspended from the cervical and upper

dorsal region of the spine largely by the trapezius and by the rhomboid and serratus sheets of muscle. These were, of course, already present in the anthropoid stage, but the reflex postural mechanism which forces the trunk to sustain the weight of the shoulders and arms rather than the arms to suspend the weight of the trunk, as in arboreal life, developed late and is a characteristic of man. With the evolution of the erect position, reflex postural mechanisms developed in order to maintain it. These are controlled by nerve centers.

It was the development of a true foot that gave man his opportunity to develop his remarkable manual dexterity over other primates, who really possess four hands. And with the development of this upright posture came the increase in the size of the brain and the great increase in intellectual powers. The three main races which inhabit the world today, the Caucasian, or white, race, the Mongolian, or yellow, race and the Negroid, or black, race are not more than 50,000 years old. There is tremendous variability within these races, and surprising changes in any single type take place in a period of a thousand years. Seeing the various types of individuals among the European group and the definite upsets from normal caused by certain growth factors in endocrine substances, one recognizes shifts in the physiology of the body even in a limited group. We have become what we are because of growth substances within the tissues of the body and not because of inherited anatomic changes. Sir Colin MacKenzie[3] said: "If we exclude specific infectious diseases . . . we may define health as a correlation of all the bodily systems to the erect posture, and ill health as a failure of one or more systems to correlate to it." Dr. Joel Goldthwait[4] was one of the first clinicians to recognize the relation between the erect posture and health and to insist on the correction of bodily mechanics as an important part in the treatment of chronic disease.

I shall sketch only briefly a few examples of the purely anatomic, or mechanical, pathologic change that occurs largely as a result of the development of the erect posture, as this is described frequently in the literature and space does not permit a discussion here. It is well recognized that anatomic variations are most common in the lumbosacral and cervicodorsal areas, where the most significant evolutionary changes have occurred. In the lumbosacral region sacralization of the fifth lumbar vertebra or lumbarization of the first sacral vertebra, failures of fusion and variation in the plane of the facets are common findings. The tilt of the pelvis, which is controlled partly by the abdominal muscles but largely by the muscles which control the position of the pelvis with relation to the femurs, causes variation in the compensatory curves of the spine, and postural strains result, followed by traumatic arthritis, particularly when there is sharp angulation at the lumbosacral junction.

The cervical portion of the spine developed its curve, with the resulting balance of the head on the spine, very late with respect to other changes. Therefore, it is not strange that a prominent seventh cervical vertebra is often seen and with it the forward tilt of the head. This postural variation should be recognized and no attempt to force a backward position of the head should be made, as a conscientious patient can develop traumatic arthritis in the foramens of the cervical vertebrae with severe radiating pain as a result. A seventh cervical rib and a tight scalenus anticus muscle are developmental anomalies with definite trains of symptoms. The midcervical portion of the spine, where the anterior curve is marked, is the point of the most constant strain, and arthritis and narrowing of intervertebral spaces are common between the fifth and sixth cervical vertebrae and to a less

extent between the fourth and fifth. Strain or changes in the angulation in any of the spinal curves which tend to cause decrease in the size of the foramens result in irritation to sensory nerves, and radiating pain occurs. Radiation about the trunk frequently causes pain simulating visceral disease, and differential diagnosis is vital. Further mention of this will be made later. Subacromial bursitis or shredding of the supraspinatus muscle can be attributed to the suspension of the shoulders and arms from the trunk with a definite increase in strain. In anterior poliomyelitis if only one or two muscles of any part are involved these are usually among the ones which took on new functions when the erect position developed, as represented by the deltoid, quadratus femoris and tibialis muscles.

Goldthwait looks on the diaphragm as the key organ to proper aeration of the lungs, to normal circulation and to correct functioning of the abdominal and pelvic viscera. When one remembers that during the stages represented by gibbon and anthropoid the heart became bound to the diaphragm and that the diaphragm through the pericardium became bound to the roots of the lungs and through the ribs became bound to the sternum to permit the lifting of the chest, making the thoracic breathing required by the upright posture possible, one must realize how important the diaphragm becomes. Aeration of the apexes of the lungs occurred with these modifications, and abdominal breathing became secondary to thoracic breathing. Good mechanical alinement, then, is necessary to the proper aeration of the apexes.

Failure to maintain a correct postural alinement is noted most often in the slender asthenic person. Increased lumbar lordosis results in an increase in the dorsal and cervical curves. The ribs are forced downward as the dorsal kyphos increases, so that the diaphragm attached to them is lowered and the heart loses its support and drags on the cervical fascia. Most frequently the heart appears elongated, only its tip touching the diaphragm, but in some instances the diaphragm sags to such a point that it is really held up by the abdominal viscera, and therefore the heart takes a more transverse position than usual. Postural correction may then cause the diaphragm to appear to lower its position and the heart to rotate to take a more elongated position. This may account for the fact that certain persons continue in good health in spite of a very poor posture.

I shall consider first the physiologic changes related to the thoracic viscera. Patients having functionally poor postural alinement have been checked before correction and again after postural training has been instituted.[5-6] When a corrected posture has been obtained and maintained without strain it has been shown conclusively that respirations are slowed and become deeper and pulmonary ventilation is improved. The vital capacity is routinely increased. Accompanying these changes is an increase in the diaphragmatic excursion. Circulatory efficiency is benefited. This is shown by a slowing of the pulse and an increase in blood pressure.

M. S., a woman, 40 years of age (fig. 7) showed the marked sag that can occur in the entire posture and therefore in all viscera. She complained of loss of strength, fatigue and coldness and also of abdominal distress. Elevation of the diaphragm, with the improvement in ventilation, caused a marked improvement in her general health.

When aeration is poor, the hemoglobin and the number of red blood cells rise above normal.

J. B. B., a man, 52 years of age (fig. 8), was seen because of acute low back pain. Roentgenologic examination of the lumbosacral joint revealed definite narrowing of the pedicles and facets of the fifth lumbar vertebra attributable to the chronically poor postural alinement. The symptoms cleared with six weeks of treatment with

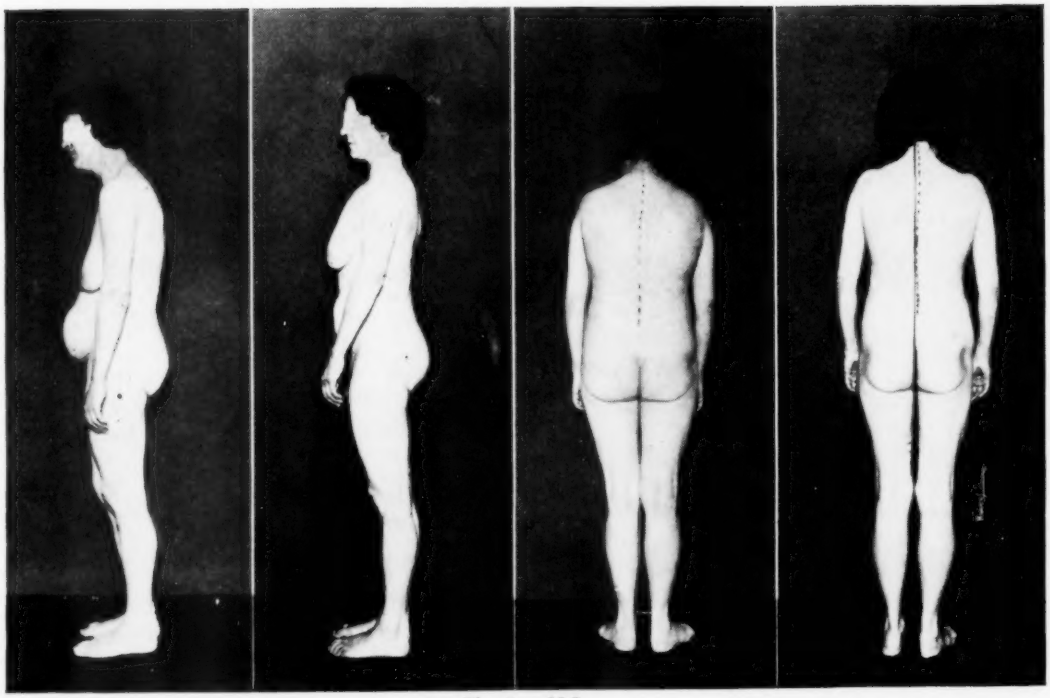

Fig. 7. — M.S.

heat, massage and postural training, but his muscular control remained poor. Routine examination of the blood showed a hemoglobin content of 110 per cent and a red blood cell count of 5,900,000.

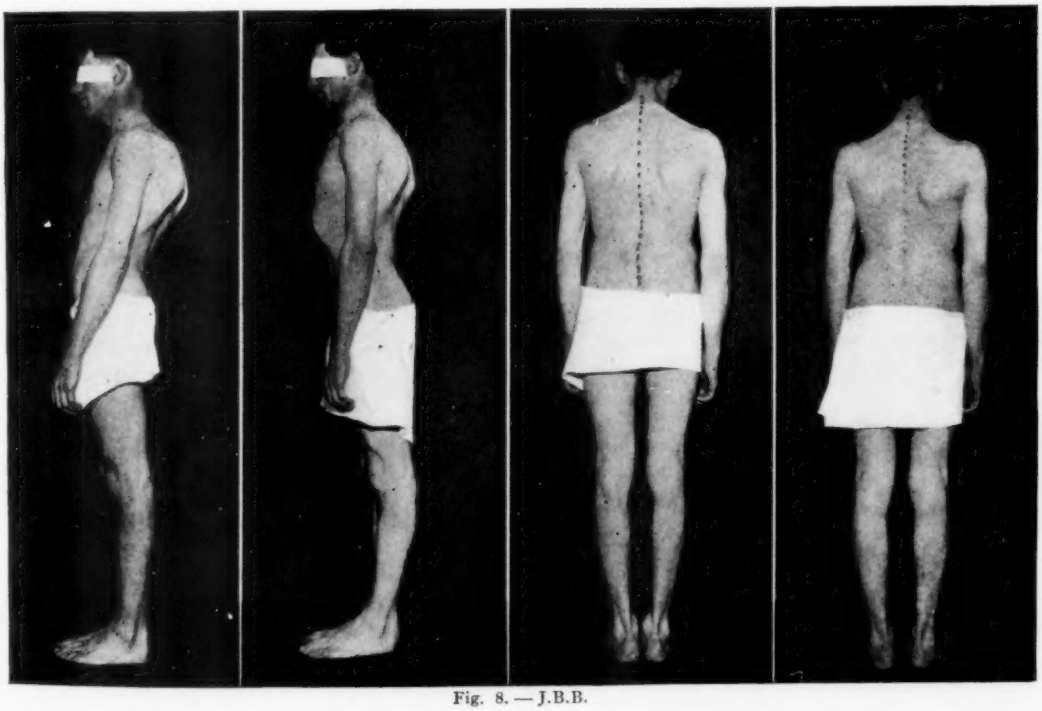

Fig. 8. — J.B.B.

Symptomatically, persons unable to stand more than a few minutes without fainting are able to stand for a long period in a well balanced correctly maintained position.[7] Development of the legs is much greater in man than in any of the primates, and a far greater supply of blood is required by them. It must be returned to the heart under pressure great enough to support the vertical column. Stasis caused by failure of correct diaphragmatic action may be to a large measure responsible for the increased volume of blood in the venous reservoirs of the abdomen and so results in inefficient circulation. This may also be responsible for varicose veins and hemorrhoids and possibly for some other peripheral vascular disease.

In M. M., a woman, aged 40 (fig. 9), poor circulation in the feet was evident. This patient's blood pressure was 90 systolic and 56 diastolic instead of a more nearly normal one of 135 to 140 systolic and 80 diastolic.

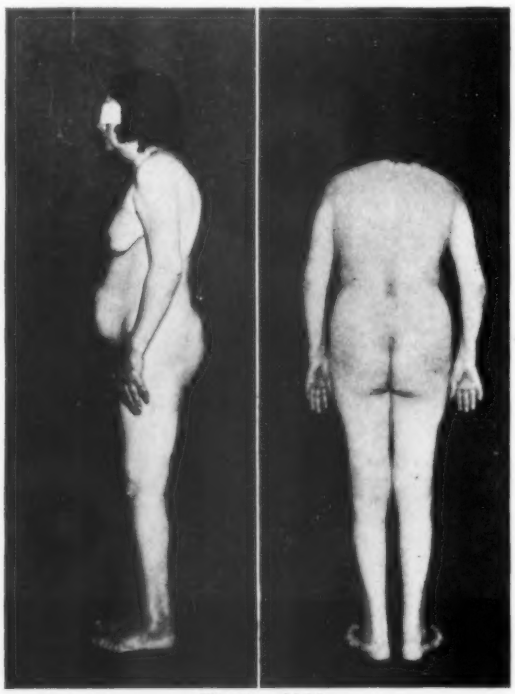

Fig. 9. — M.M.

Another respiratory condition which is of interest and in which the mechanism is quite different is so-called postural emphysema.[8] This is most commonly seen in obese persons over 40 years of age. A kyphosis of the dorsal portion of the spine develops, and the fat in the abdominal wall causes a downward drag on the viscera and therefore on the diaphragm. The ribs take a horizontal position, and expansion of the lungs is difficult in the standing position. When in the upright position breathing is labored, and cyanosis and edema are common. Treatment consists of supporting the abdomen to permit the diaphragm to rise, postural correction and reduction in weight, and such therapy routinely relieves the symptoms.

Since the abdominal muscles had to take on the job of supporting the viscera in addition to opposing the downward thrust of the diaphragm, a thoracic sag which lowers the diaphragm must force the abdominal viscera downward. The pelvis tilts downward and forward with the increased anteroposterior curves, so that the viscera are thrown forward against the ab-

dominal musculature. The abdominal muscles lose tone because of the pressure from within against them and because of the increased stretch or elongation that has to occur when the pelvis, to which they are attached, tilts downward. A gradual stretching of the fascias and ligaments which seal the organs to their proper places takes place. Once these have been permitted to stretch, correction of the mechanics of the body and strengthening of the abdominal wall do not replace them. The stomach is elevated at times provided it can once be gotten above the mass of the iliopsoas muscles and provided the abdominal muscles are toned to contract against the iliopsoas muscles in an hour glass position. The small intestine and the colon are never elevated. However, while Carnett[10-11] was insisting that pain and tenderness in the abdominal wall are frequently due to neuralgia caused by irritation of the sensory nerves as they leave the spine because of poor posture or arthritis and while he was emphasizing that failure to recognize this fact had led to a tremendous number of useless abdominal operations, he noted that correction of posture, particularly in the asthenic person, not only relieved the pain in the abdominal wall but relieved many digestive disturbances as well. Later, Abbott[12] studied a group of patients with duodenal stasis who suffered from such symptoms as nausea, headache and abdominal pain and found that symptoms occurring with duodenal stasis, such as nausea, pain, headache, constipation and fatigue, are frequently relieved by postural correction even though the viscera are not replaced and even though little change in the duodenal stasis and visceroptosis could be demonstrated.

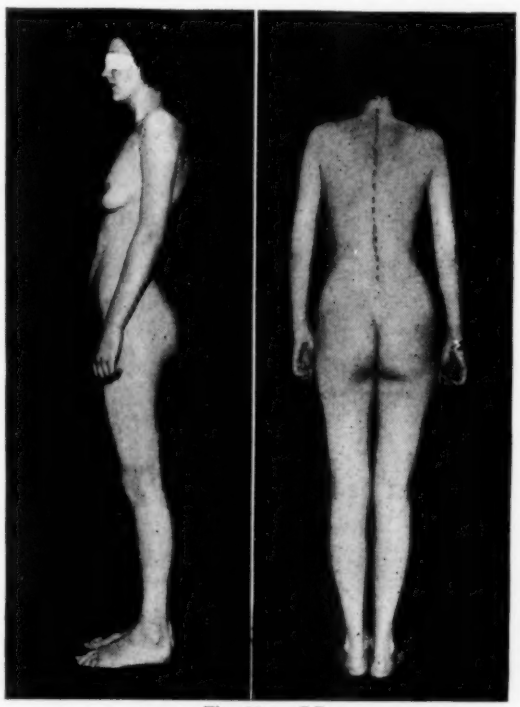

Fig. 10. — C.R.

C. R., a woman, 31 years of age (fig. 10), complained of pain four hours after eating. She was constipated. These symptoms persisted in spite of dietary control. There was a question of peptic ulcer at one time and of chronic cholecystitis at another. Later she complained of backache. This was treated by postural training, with relief not only of the back pain but of the abdominal symptoms as well.

H. L., a woman, 31 years of age (fig. 11), complained of pain over the left side of the chest and of tenderness over the right abdominal area. She had had the fallopian tubes removed for suspected hydrosalpinx. Pelvic and abdominal examinations revealed no disease. Postural training relieved the symptoms, the correction being obtained in less than one month.

Orthostatic albuminuria is a condition seen most often in children. The albumin is absent from the urine after the lordosis of the lumbar portion of the spine is corrected either by postural training or by a plaster cast. The pathologic process is caused by pressure on the vein leaving the left kidney as it crosses over the anterior surface of the spine to the vena cava.

Many other possibilities have been considered but are even more difficult of proof than those already mentioned (Goldthwait). I believe that there is sufficient evidence of the benefits of a properly maintained erect position to make postural correction an important part of treatment. Above

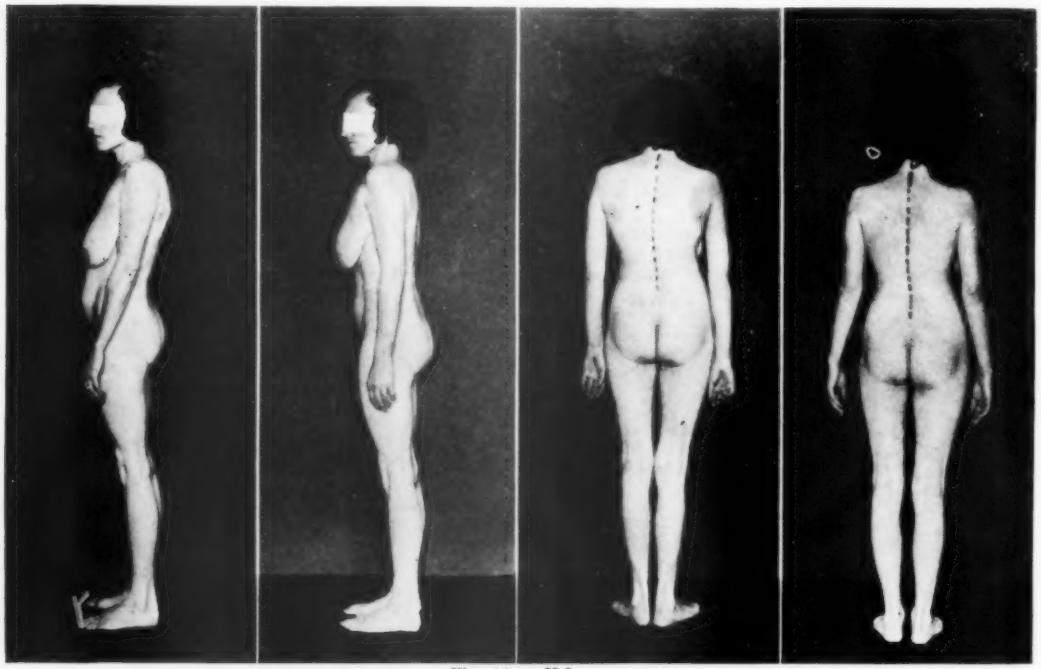

Fig. 11. — H.L.

all I believe that postural correction in the child is of greatest importance, since it acts as a prevention against visceroptosis and other changes, which are so difficult to correct once they have occurred. May I conclude with the definition of the White House Conference Committee: "Body mechanics is the mechanical correlation of the various systems of the body with special reference to the skeletal, muscular, and visceral systems and their neurological associations. Normal body mechanics may be said to obtain when the mechanical correlation is most favorable to the function of these systems."

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In the August issue another interesting article by Dr. Baker will be published. — EDITOR.

THE KENNY METHOD OF TREATMENT FOR INFANTILE PARALYSIS *

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MINNEAPOLIS

Since June, 1940, The National Foundation for Infantile Paralysis has sponsored a study of the Kenny method of treatment for infantile paralysis at the University of Minnesota Medical School, under the direction of the Department of Orthopedic Surgery and Physical Therapy.

Miss Elizabeth Kenny has been in personal charge of the work except for an interval in the late winter and spring of 1941 when she returned to Australia. In her absence the work was continued by her assistant, Miss Mary Stewart Kenny.

The original observational ward was established in June, 1940, at the Minneapolis General Hospital by special grant of the Board of Welfare of the City of Minneapolis on the recommendation of the Hospital Staff. Since July, 1941, wards have been made available at both the University of Minnesota Hospital and the Minneapolis General Hospital.

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In January, 1941, after the first period of observation, a preliminary report to the National Foundation was published, with some deletions, in *The Journal of the American Medical Association* of June 7, 1941. The authors said:

"We think it is possible and appropriate to state definitely that these patients with acute infantile paralysis are much more comfortable and cheerful during the acute stage than are those cases who are immobilized and that we have seen absolutely no contractures . . . following this treatment. Even the most severely paralyzed patient has passively full range of motion in all his joints. No scoliosis or other spinal deformity has developed in these cases and most of them are more limber than they were before the onset of the disease . . . and we believe that the paralysis is less severe than would be expected in nearly every case. Certainly no harm has resulted in any of the observed cases under Miss Kenny's care from 'abandonment of immobilization'."

The final conclusion at that time was that the Kenny method would be the basis for the future treatment for infantile paralysis. Further study and observation have shown these conclusions to be correct.

With the belief that more general use of the method is advisable this manual has been designed. It gives the basis for the treatment and a certain amount of the detail of the technic of the method as applied by Miss Kenny.

This manual is not to replace either special training in the work or the book which Miss Kenny has herself published, neither does it attempt to analyze critically the theory of the method nor to modify in any way the method itself. It is merely an attempt to clarify and simplify in the light of personal observation and experience what she has written about the technic. The various steps and procedures have not been changed and Miss Kenny's terminology has been retained. Many of the terms are not scientifically accurate as understood by physicians, but they do describe conditions which are present.

Nothing occult is involved in her methods but it does demand an intimate knowledge of muscle anatomy, the neuromuscular system and much attention to detail in reeducation. The principles can be quickly learned by the physician but the technical practice of the method requires mastery of many details if satisfactory results are to be obtained. Just who is best qualified to do this is probably debatable, but certainly, graduate nurses and registered physical therapy technicians are the two groups from which most of the workers should come.

The treatment must be begun as soon as the case is diagnosed if it is to be most efficient; this means that treatment must begin in the acute stage during the period of quarantine. Each hospital will have to develop a routine devised to make the maximum use of its available skilled personnel. Certainly the most difficult part of the treatment from the physical point of view, the application of hot packs, can be efficiently carried out by intelligent attendants or orderlies after a short training period. *Always, however, the treatment must be supervised and checked by the physician in charge of the case.* Certainly the reeducation of disabled muscles can be done only by technicians with the highest skills and abilities.

Symptomatology

The Concept of infantile paralysis on which Miss Kenny's treatment is based is fundamentally different from that heretofore prevailing. The disease in the acute stage affects not only the anterior horn cells but also ad-

jacent portions of the cord. It may be segmental in character, involving the central nervous system including the sympathetic system in general so that symptoms other than those due only to involvement of the anterior horn cells must be present. The symptoms, as pointed out by Miss Kenny and as observed by us, are mainly:

1. The muscles affected present the condition of spasm.
2. The affected muscles become shortened.
3. Coordination is disorganized and incoordination frequently seen.
4. The patient frequently loses power in non-affected muscles because affected muscles are pulling the non-affected muscles from their normal resting place and retaining them in this lengthened position through the unrelaxed spasm in the affected group.
5. The non-affected muscles frequently refuse to contract due to "mental alienation."

These symptoms may be condensed into three factors which distinguish the Kenny concept of infantile paralysis:

1. Muscle spasm.
2. Incoordination.
3. "Mental alienation."

In an exceedingly severe infection, enough anterior horn cells are destroyed at the outset to cause complete flaccid paralysis of certain muscles or parts and spasm, if present at all, may be fleeting in these cases. Treatment for this condition is ineffective in preventing the paralysis.

Muscle Spasm

The term "muscle spasm" denotes a group of symptoms including fibrillary twitchings (fasciculation), hyperirritability of the muscle to stretching and a more or less tonic state of contraction of the muscle fibers which frequently cannot be overcome even by great force. The exact pathologic significance of these symptoms is not well understood at present although physiologic studies indicate that there are neuromuscular mechanisms which could produce the observed symptoms. Some reports of late pathologic changes in muscle have been published, but apparently there have not been published studies on the local pathology of muscles during the acute stage of infantile paralysis.

Examination of the patient acutely ill with anterior poliomyelitis brings strikingly to attention that he suffers from something more than weakness of muscles. Rather are the affected muscles painful, tender, irritable and in spasm. Probably this acute process in the muscle bears an important relationship to the deforming fibrotic changes in muscle common in the chronic stages of the disease when ineffectively treated in the acute stage. It follows that the treatment of poliomyelitis must begin immediately with the onset of the disease, if grevious after-effects are to be avoided.

If unrelieved, spasm will result in destruction of muscle tissue and in eventual permanent changes and deformities. Hope of restoring function to the damaged motor mechanism depends upon keeping the muscles soft, long and receptive through the prompt relief of this spasm. Muscle spasm will cause, beside the actual damage to the muscles affected, further disruption of the motor system by eliminating or "alienating" non-affected muscles and will produce incoordination of the muscles concerned in the joint motions of the region involved.

A muscle in spasm is a muscle attempting to shorten itself. The effect of this on the limbs of the patient early in the disease is known. Temporary contractures appear, which if unattended soon develop into fixed deformities

The spasm might even indicate an inflammatory condition of the muscle, as the process appears with the onset of symptoms of the disease and continues if untreated until the muscle is reduced to a fibrous inextensible mass. Examination of a patient who has not been treated for spasm leads to the conviction that the patient suffers frequently from stiffness and contractures, rather than from paralysis or weakness. The shortening of muscle from the process of spasm is the cause of the deformities. Muscle is normally an elastic tissue and depends for its function upon the property of being able to lengthen and contract itself. If the muscle is allowed to become short through spasm or any other process its useful power is definitely lessened. Furthermore, inability of a muscle to lengthen imposes a severe restriction on the action of its opposing muscle.

Muscles untreated for spasm do become permanently shortened and fibrosed. Active spasm is associated with pain and hyperirritability of the muscle. Sudden stretching of the muscle affected, it will be observed, is followed by an attempt on the part of the patient to relieve the tension in the muscle. For instance, if the gastrocnemius is in spasm, an attempt at forced dorsiflexion of the foot will be followed by flexing of the knee to relax the gastrocnemius. The attempt to keep a hyperirritable muscle under tension, as in a cast or splint, induces a stretch reflex which further increases the spasm and adds to the damage in the muscle tissue. Active spasm, if untreated, evolves into a state of chronic contraction and finally results in fibrosis and fixed contractures. With treatment the active stage of spasm can usually be made to subside within a short time but the tendency of the affected muscle to remain in a state of contraction may continue for weeks or months. Treatment, however, must be persistent until all stiffness has been relieved and the muscles restored to their full length, as evidenced by full and complete range of joint motions. If proper treatment is applied there will not be deformity and the muscles will be preserved in a soft, flexible state, receptive to nerve impulses. Spasm at times may recur after apparent recovery if coordination has not been restored and will require additional treatment.

The principal locations of demonstrable muscle spasm in approximate order of frequency are:

1. Hamstrings.
2. Back and neck.
3. Posterior calf muscles.
4. Pectorals.
5. Muscles of respiration.
6. Quadriceps.
7. Biceps of the arm.

Spasm is also frequently found in the forearm and anterior leg muscles.

Detection of Spasm. — Spasm may be diagnosed by observation alone in many instances through the presence of abnormal skin creases, prominence of muscle bellies or tendons and characteristic positions assumed by the part. Often the physician is able to locate the spasm by observation and palpation without necessarily encouraging any painful motions. The diagnosis becomes obvious when the muscle in spasm is passively stretched. Care should be taken not to aggravate spasm by too frequent examination to demonstrate spasm during the acute stage. The diagnosis should be made by observation alone if possible.

In the following discussion the entire body is covered in some detail starting with the neck and proceeding through to the feet, giving the characteristics of the spasm in each location.

Neck. — Inspection may show a prominence of the extensor group of muscles, including the posterior neck muscles, with a deep cleft between them. The head may be pulled back in hyperextension. Attempts of the patient to flex the neck usually call the platysma into play and the patient struggles to flex the neck with the head still hyperextended. When told to put the chin on the chest the patient will usually open the mouth but the neck will still remain hyperextended. In milder degrees of spasm, pain in the back of the neck can be elicited by flexing the neck passively. Rotation of the head from side to side will often show that the sternomastoids are still functioning in spite of the fact that they cannot bring the head forward. Spasm in one sternomastoid will turn the face toward the opposite side.

Shoulder Girdle. — A spasm in the pectoralis major is often shown by the presence of several creases at the anterior axillary line, and a forward angulation of the head of the humerus, resulting in a cupped shoulder. On attempting abduction, either actively or passively, the movement is stopped by pain which is located by the patient in the anterior axillary fold.

Spasm in the upper trapezius or levator scapulae is shown usually by an elevation of the shoulder.

Spasm in the latissimus dorsi is manifested by pain in that muscle on abduction of the arm. The teres major may be a tight band between the scapula and humerus.

Spasm in the deltoid results in a characteristic position of abduction of the arm and the arm cannot be brought to the side without pain.

Arm. — Spasm in the biceps is shown by an inability to extend the elbow to 180 degrees. The biceps tendon can frequently be felt to stand out as a tight band in the region of the elbow. Spasm in the triceps is shown by inability to flex the elbow actively or passively without pain.

Forearm. — Spasm in the flexor muscles of the forearm is shown by a flexed position of the fingers and hand and inability to extend them without pain. Spasm in the extensor muscles of the forearm is not usually present except with concomitant spasm in the flexors. It is rather difficult to elicit in the acute stage except by tenderness to pressure.

Spasm in the supinators and pronators is shown by limitation of motion and pain on carrying out the opposing motion. Spasm in the long flexors and extensors of the fingers and the abductors of the thumb may be indicated by the prominence of the respective tendons.

Hand. — Spasm in the opponens pollicis is shown by tenderness in the belly of the muscle and inability to abduct the thumb. Spasm in the interossei and lumbricales is shown by stiffness of the fingers.

Trunk. — Spasm in the back is evidenced by pain, stiffness and inability to flex the back actively or passively. Spasm may be so severe as to cause an exaggerated lordosis or an opisthotonus which is so painful when the patient lies on his back that this position cannot be endured for more than a few minutes at a time.

Spasm in the back muscles may be localized to various areas or to either side with resultant scoliosis, localized kyphosis and numerous other deformities.

The erector spinae group is not usually prominent but is flattened and narrowed by the spasm. The spine is curved with the concavity toward spasm. If there is extensive spasm in the back the abdominal muscles usually are "alienated."

Spasm in the intercostals causes interference with respiration and is evidenced by a depressed or elevated position of the thoracic cage. The patient attempts to assist respiration with the accessory respiratory muscles. Spasm in

the pectoralis major also interferes with respiration and usually is present in combination with spasm in the intercostals.

Spasm in the diaphragm may be shown by a depression in the lower ribs forming a groove around the chest in the presence of an elevated chest, in which case the patient's difficulty is not with inspiration but with expiration.

Spasm in the psoas may cause flexion at the hips and pain on attempted extension or hyperextension. This is especially prominent if the patient has been lying on his back with the knees and hips slightly flexed by pillows under the knees.

Spasm in the lateral abdominal muscles causes apparent shortening of one leg by elevation of the pelvis on that side and the anterior superior iliac spine may be unusually prominent on the same side.

Spasm in the rectus abdominis is shown by an exaggerated groove over the linea alba with prominence of the involved muscles.

Special attention should be drawn to certain conditions in which spasm may endanger the life of the patient, particularly in affecting the respiratory mechanism. The most common of these is spasm of the posterior neck muscles, causing retraction of the head. The difficulty in swallowing with the resulting collection of mucus and saliva in the throat adds to the respiratory embarrassment of the patient. Prompt attention to the muscles affected is imperative in conjunction with the other procedures of keeping the respiratory passages clear. A second condition involves the muscles of respiration directly. Spasm may affect the intercostals, the diaphragm or the pectorals, and by this action mechanically inhibit motions of the chest. Spasm of the pectorals especially, combined with spasm of the intercostals, prohibits inspiration and when the condition is severe the chest may become absolutely rigid. In this situation the muscles of the neck attempt to assist and the sternomastoids frequently stand out prominently. Spasm of the diaphragm interferes with expiration. The patient is able to take in and hold his breath, but cannot expel it. In diaphragmatic spasm a depression of the ribs at the level of the insertion of the diaphragm will be noticed on inspection.

Hip and Thigh. — Spasm in the gluteus maximus may cause external rotation of the thigh and prominence of the involved muscle or, in the extreme case, the natal cleft may be widened so that the anus is exposed to view. Spasm in the gluteus medius is shown by a cup-shaped depression just superior to the greater tuberosity of the femur. Decrease of the gluteal crease is caused by spasm in the gluteus maximus.

Spasm in the hamstrings may be more marked on the inner or outer sides. It can be demonstrated in the mild forms by straight leg raising passively, in which case the thigh cannot be brought to a right angle with the trunk when the knee is straight. Pain in the posterior muscles of the thigh is produced by this test.

Loss of or diminution in the gluteal crease indicates spasm in the long head of the biceps femoris.

Spasm in the tensor fascia lata is shown by a tight band on the lateral surface of the thigh toward the knee.

Spasm in the quadriceps is shown by inability to flex the knee without pain and prominence of the muscles involved, especially the rectus femoris.

Spasm in the sartorius is shown by a prominence in the region of the anterior superior spine of the ilium. It may cause external rotation of the leg and may cause an exaggerated lordosis by pulling the pelvis forward.

Spasm in the adductors is shown by tenseness in the medial portion of the thigh and inability to abduct the leg without pain in those muscles.

Leg. — The posterior calf muscles are a common site for spasm which may be present in the soleus or gastrocnemius alone, in either the medial or lateral head of the gastrocnemius, or any combination of these. Spasm in the lateral

head of the gastrocnemius is shown by eversion of the heel and in the medial head by inversion of the heel. Spasm in the soleus is shown by pain on passively dorsiflexing the foot with the knee flexed.

Spasm in the anterior leg muscles is shown by prominence of the tendons of the involved muscles, or occasionally by a calcaneus position of the foot if there is no accompanying spasm in the calf.

Spasm in the long flexors and extensors of the toes may be shown by prominence of their respective tendons, hammer toes and other deformities.

Spasm in the posterior tibial is shown by a tendinous ridge just posterior to the medial malleolus.

Foot. — Spasm in the intrinsic muscles of the foot is shown by deformities of the toes, pes cavus, or pain on stretching.

Incoordination

"Incoordination," the second of the major symptoms of infantile paralysis, is principally of two types:

1. That due to the spreading of motor impulses intended for a certain muscle to other muscles or groups of muscles due to such condition as pain on attempted motion of the involved muscle or inability of that muscle to perform its proper function.

2. That occurring within the involved muscle itself so that ineffective contraction is produced instead of a coordinated rhythmic contraction producing maximum motion at the insertion of the muscle.

Uncontrolled voluntary motion when attempted in the presence of spasm leads to the symptom of incoordination by the development of abnormal motion patterns and misuse of muscles. Active motion on the part of a patient unless carefully supervised and directed may do great harm, therefore, and lead to difficulties in securing the return of normal function.

"Mental Alienation"

"Mental alienation," the third of the major symptoms of infantile paralysis, is the term used by Miss Kenny to describe a condition in which there is inability to produce a voluntary, purposeful movement in a muscle in spite of the fact that the nerve paths to that muscle are intact. This is a physiologic block which must be distinguished from the organic interruption resulting from destruction of anterior horn cells by the disease. "Mental alienation" may conceivably be produced in several ways, the most frequent being the following:

1. A muscle is pulled beyond its normal resting length by its opponent which is in spasm.

2. A muscle may become "alienated" when pain is produced in its involved opponent by the attempt of such unaffected muscle to contract.

3. The spasm, or its later results, in an affected muscle may be so severe that the braking action or check on the normal opposing muscle may discourage the latter enough to produce "alienation."

4. The disease may produce changes in the nervous system which do not actually destroy the cells or fibers but do cause loss of conduction power and in terference with normal neuromuscular action.

Muscles that are non-functioning due to "mental alienation" may remain permanently in this state unless treated.

An example of "mental alienation" not due to infantile paralysis, frequently seen by orthopedic surgeons, is the inability of some patients to contract the quadriceps after a knee operation or other painful lesion of the joint. Sometimes reeducation is needed for a prolonged period before normal control of the muscle is obtained in these cases.

Treatment

The Kenny treatment should be begun as soon as the diagnosis of infantile paralysis is made. The patient is put to bed on a firm mattress with bedboards placed beneath it. A foot board is used which extends from eighteen inches to two feet above the level of the springs to assist in keeping the bed clothes off the patient's toes. This foot board is propped away from the end of the mattress by 4-inch wooden blocks. The purpose of the foot board is to allow the patient to maintain the normal standing reflexes during his stay in bed and it is not in any sense a splint. The mattress is separated from the foot board so that the heel can rest against the board when the patient is lying on the back, and the toes can project below the mattress when he is lying on his abdomen. The patient is placed in bed in a position as closely approximating the normal standing position as possible with the body straight, the arms at the sides and the legs in a straight line. A folded towel or small pad may be used under the knees to prevent hyperextension. If spasm is severe, modifications of this position may be necessary to allow relaxation of the spastic muscles. For example, with a severe spasm of the back causing hyperextension of the spine, the patient may be placed on the abdomen with a pillow under the chest and under the pelvis, or on the back with a pillow in the lumbar region to exaggerate the deformity and thereby allow relaxation of the muscles involved. If there is active spasm in the posterior calf muscles, the foot is not put in contact with the foot board until the spasm has been released.

Spasm

As soon as spasm is diagnosed, treatment should be started by the use of hot fomentations which are prepared in a manner somewhat different from the usual procedure. Woolen cloths such as old blankets are cut to fit the parts accurately so that there will not be too much bulk by folding, but so that there are two thicknesses over each area to be treated. A light waterproof covering is used and around this a piece of dry woolen material of appropriate size and shape is wrapped and pinned in position. These outer coverings are spread out and placed accurately in position under the area to be treated before the hot flannel is removed from the container.

The foments are boiled and wrung from the boiling water twice through a very tight wringer at the bedside so that as much water as possible is removed. They are then applied directly and as quickly as possible on the part so as to minimize any chance for cooling. It is well to use old wool for the wet packs because new wool seems to be more irritating to some patients. It is unnecessary to protect the skin with ointments although some patients show sensitivity to the application of wet heat by a skin rash but burns should not occur. The packs are placed accurately over the entire muscle and care should be taken to make them of adequate size since the wool tends to shrink from the boiling.

Joints should not be covered by the packs because of the resultant limitation of motion and increased difficulty of treatment unless the involved muscle itself covers a joint, as for example, the deltoid covering the shoulder joint. In the hand and foot, of course, joints are necessarily covered because of the small area involved. The packs do not in any way constitute splints and they must not give the patient any sense of fixation. They are renewed usually every two hours, but may be applied as often as every fifteen minutes when the spasm is unusually acute or threatens the life of the patient, as in involvement of the muscles of respiration. In such a case the wet packs may be used without covering. The packs are continued uninterruptedly being changed as indicated throughout twelve hours of each day. The alternate heating and cooling of

the parts as accomplished by these packs seems to be the factor which tends to overcome spasm.

Passive motion through the range that can be obtained without pain is carried out at least once a day but care should be taken not to aggravate spasm by too frequent examination.

The Kenny technic does not permit muscle testing or the use of respirators. Muscle testing, which incidentally has never been accurate in the acute stage of infantile paralysis, is definitely dangerous because of the likelihood of exaggerating spasm, or of producing incoordination and "alienation." The respirator is not used because its mechanical action in pulling on the ribs tends to aggravate the spasm in the intercostal muscles and because the treatment in the cases in which spasm is the cause of respiratory difficulty, should be by hot foments. The cases in which the higher centers are involved are not benefited by either treatment, and may be definitely damaged by the use of the respirator.

Muscle Reeducation

The Kenny method of muscle reeducation is based on the symptoms and concept of the disease previously described.

First, it is assumed that nerve cells are not permanently or completely destroyed until failure of the muscles supplied by those cells to respond to treatment indicates the destruction has occurred.

Second, in addition to anterior horn cell destruction the lack of function is considered to be also the result of loss of connection with the central nervous system either through "mental alienation" by which the impulse is suppressed, or through incoordination by which the impulse is diverted to other channels, or both.

The purpose of reeducation is to restore connection of the part with the central nervous system, (to restore "mental awareness"). Muscle strength is not a primary consideration but the reestablishment of "awareness" and the production of a normal rhythmic motion, no matter how weak, is the aim of the treatment. Increase in muscle strength will follow. Muscle testing in the form of attempts to determine muscle strength by isolated action of individual muscles is avoided because of the danger of producing or increasing incoordination and "alienation" as well as spasm.

The neuromuscular system is highly specialized. Although each muscle has a definite primary action, which is a direct pull upon its insertion, it rarely acts alone because of the integration and cooperation of the adjacent muscles. When a joint is moved in any specific direction a number of related muscles come into play. However, there is usually one muscle which is primarily responsible for any given motion and this muscle can be known as the prime-mover of the joint in that particular direction. One must also remember that for each motion performed by a muscle there is an opposite motion performed by an opposing muscle and that the effective function of a joint depends upon the orderly regulation of these opposing units by the controlling nervous system. When a flexor begins to contract the extensor must simultaneously elongate in a graduated manner so that smooth action of the joint results. The elongating muscle must retain at all times a certain amount of tonus so as to be able to contract immediately and reverse the joint motion. This harmonious action which allows a smooth, orderly and effective functioning of muscles is well referred to as coordination. The disappearance of a particular muscle action from the motor scheme, whether due to direct involvement of the innervation of that muscle by the disease, to indirect involvement by "alienation," or some other cause, will result in attempts by the adjacent muscles to substitute for the lost motion with the development of incoordination.

In starting muscle training this substitution of muscle action must be completely removed and prevented. Every mental and physical effort of the patient must be guided to the muscle which is being trained and to that alone. Allowing and even encouraging a patient in the free choice and substitution of muscles for the mere satisfaction of haphazard motion of the joint invites disaster.

Technic of Muscle Reeducation. — As soon as joints can be moved passively through a small range without pain or incoordination indicating that spasm is lessening, muscle reeducation within that range is started with the patient still in bed. At first this consists largely of maintaining or developing a "mental awareness" of the muscles and their insertions. Later, as spasm decreases, the more active reeducation can be added. In the presence of incorrect muscle action such as substitution or incoordination, active motions on the part of the patient are prohibited until passive motions can be carried out by the technician with complete relaxation of the patient. Having achieved this state, voluntary motions on the part of the patient may be instituted but such action is always under the control and guidance of the technician. For this later muscle reeducation the patient is placed on the treatment table in as normal a position as possible. This is considered to be the usual standing position with the arms at the side, the legs in a straight line with the body, the feet at right angles and the knees straight. The patient must be relaxed and cooperative. Reeducation cannot be carried out in babies who are crying, or in children or adults who are fearful of pain or other harm. Therefore reeducation cannot be attempted before painful spasm is eliminated.

Before treatment is started the patient is instructed to lie quiet without using any muscles other than the ones to be treated. His attention must be concentrated solely on the motion to be performed. The technician then firmly grasps the part to be treated and without causing pain carries out the intended motion passively through whatever range is possible without pain. The technician instructs the patient concerning the part to be moved by stroking the exact insertion of the muscle group to be trained. With the patient concentrating on this point of insertion the motion is carried out twice passively and then the patient is instructed to attempt to carry out that motion actively. A muscle, whether paralyzed or "alienated," which is being trained, must be made to contract at least in a mental sense if in no other way; the conscious mind must accept this "awareness" of the muscle if orderly and coordinated action is to be obtained. If any visible or palpable motion is accomplished, the treatment is stopped immediately in order to leave with the patient the memory of the accomplishment. If any muscles other than the one to be trained come into play, the attempted motion is stopped immediately and the unwanted muscles put out of action by instructing the patient to do so or by finger pressure against the muscle. Much care is observed to prevent incoordination, which is shown by this attempt of the patient to bring other muscles into play. Care is taken also not to tire the patient in any way. Treatment must be discontinued if the patient shows evidence of fatigue or is uncooperative for any reason. As the patient learns how to move the muscles, more movements are given, gradually increasing the range and number of motions, although enough work to tire the muscle is never allowed.

If there is no trace of motion in spite of absence of spasm, the proprioceptive reflexes are stimulated by placing the muscle slightly on the stretch and then stimulating the muscle through the tendon by moving the joint backward and forward. This procedure is repeated daily or several times daily even while the patient is receiving hot foments. Miss Kenny has demonstrated that function of that muscle should eventually return if the muscle can be stimulated by this procedure so that the course of the tendon can be followed from its

insertion to the muscle belly. "Loss of tendon" which indicates complete loss of muscle tone is an indication of probable permanent and complete loss of function.

For a proper understanding and execution of muscle reeducation by Miss Kenny's technic a knowledge of her classification of muscles is necessary.

Group 1. Muscles that contract within their normal resting length.

Group 2. Muscles that have to be removed from their normal resting length before a suitable contraction can occur to perform their primary action.

Group 3. Muscle group with separate origin and common insertion and multiple action.

Group 4. Muscle groups with dual origin and dual insertion and multiple action.

Group. 5. Muscles that stabilize positions obtained by other muscle groups.

The first two are most important groups.

The biceps of the arm and the hamstrings belong to the first group and the triceps and quadriceps to the second and one example will show the importance of this classification. The quadriceps, to contract so as to perform its normal action, must first be pulled from its normal resting position by flexion of the knee. Only then can the pull be placed at the insertion of the patellar tendon and the knee extended. The performance of this motion is the primary function of the quadriceps muscle. So-called "setting" of the muscle with the knee extended does not have any place in the Kenny method.

Muscle reeducation, then, depends upon the relief of spasm, the teaching of muscle awareness, the combating of incoordination and "alienation," and the retraining of nerve pathways back to the non-functioning muscles.

In the following discussion, a fairly complete description of the reeducation of the neck muscles will be given. After that, the muscles performing the action and the insertion to be pointed out will be stated. Any special points to be watched will be explained. But it is understood that the same general procedures are carried out in each case. *Only two positions are used, the supine and prone, and all the anterior muscles are treated before the patient is turned over to allow the posterior ones to be attended.*

The Neck

Anterior Neck Muscles. — The posterior neck muscles are most commonly in spasm. Therefore reeducation should not be carried out until this spasm has been released or until pain has been overcome. The muscles most commonly "alienated," ("paralyzed") are the sterno-cleido-mastoids. These muscles come within the group that contract within their normal resting length and have a double action. *First* when working together they bring the head forward and downward, and *second* when working individually, they turn the head to the opposite side and the face upward. The patient is placed on the table in a supine position. The shoulders are placed at the edge of the table, and the head supported by the technician.

When the patient is completely relaxed he is instructed as to the motion to be performed. He is told that the forehead is brought forward and downward by the sterno-mastoid muscles acting from their point of insertion on the mastoid process. These insertions are stroked by the technician and the course of the muscles and direction of action is pointed out. He is asked to follow the movement mentally, but all physical action is avoided. The purpose of this procedure is to restore "mental awareness" of the part to the patient's mind. This action is repeated three times per treatment. If the technician thinks that the patient should make a physical effort, he is allowed to do so after two passive

movements have been performed. This assisted active movement thus replaces the third passive movement.

If active movement is possible, the motion must be watched closely to be sure that the action is coordinate. The contraction must be equal from both points of attachment. The patient must not be allowed to bring the platysma into action as shown by drawing the corners of the mouth downward. The posterior neck muscles must remain completely relaxed. There must be equal contraction of both sternomastoids. Inequality of contraction is evidenced by greater pressure of the side of the head on one supporting hand than on the other. The increased pressure indicates that a greater effort has been made on the side where the pressure is felt. Therefore, the attempt is made to concentrate the mental effort of the patient upon the point of attachment of the weaker side. Spasm may also cause unequal contraction.

The individual action of one sternomastoid is to bring the head to the opposite side and the face upward. This treatment is carried out in the same manner except that the patient's mind is focussed on a single insertion and the head rotated according to the action of the muscle. If one side does not contract well, spasm should be suspected in the opposing muscle. Treatment for spasm should be given to the apparently stronger muscle to secure relief of the spasm and prevent the development of a contracture or torticollis.

Posterior Neck Muscles. — In reeducation of these the patient is placed in the prone position, with the shoulders at the edge of the table and the head supported by the hands of the technician. The feet are supported by a folded towel or similar pad so that the toes do not press on the table. The patient is told that the technician is bringing the head backward toward the spine. The technician must watch carefully for unequal contraction on one side or the other. If this is present, spasm should be looked for in the anterior muscles or in the opposite posterior muscle and treated if found.

The Shoulder Girdle and Upper Extremity

Elevation of the Shoulder. — This motion is accomplished by the upper trapezius, the levator scapulae and the rhomboideus minor. When the scapula is fixed the trapezius and levator scapulae assist in bringing the head backward and rotating it to the other side. When the head and spine are fixed, these muscles cause elevation of the scapula and the entire shoulder girdle. The patient is placed in the supine position. The technician grasps the upper arm, below the attachment of the deltoid in order to support the weight of the limb. The insertion of the trapezius to the spine of the scapula is stroked and the patient's attention centered on this insertion. The technician then lifts the shoulder upward passively. When "mental awareness" has been restored the patient is allowed to perform the movement once actively. Incoordinate movements may occur in the anterior neck muscles. Spasm in the pectoralis major or minor and latissimus dorsi will interfere with this motion.

Retraction of the Scapula. — The rhomboideus major and minor, and the component of the latissimus dorsi pulling downward and medially, the levator scapulae pulling upward and medially, and the trapezius pulling upward, downward and medially, carry out this motion. The insertion to be pointed out is the vertebral margin of the scapula, particularly the inferior angle. The prone position is used. The shoulder is supported by the technician's hand and the shoulder and scapula brought back toward the midline passively, with the patient concentrating on the motion. The arm must be relaxed so that the shoulder extensors do not come into play in this motion with the resultant tendancy to tip the head of the humerus anteriorly. Spasm or incoordinate motion of the pectoral muscles are most likely to interfere with this motion. In this case

the patient will attempt to rotate the shoulder inwardly and then draw it backward. Miss Kenny states, "To combat this, the patient is directed to understand that the chest is pressed upon the table during the time the passive movements are performed by the technician."

Abduction of the Shoulder. — The deltoid and the supraspinatus are largely responsible for this motion. The treatment is given in the supine position. The insertion of the deltoid into the deltoid tuberosity of the humerus is stroked and pointed out by the technician. The technician grasps the elbow of the patient with one hand and supports the forearm and hand against his forearm. The other hand is placed over the upper trapezius. Abduction and adduction are usually taught in sequence. The muscles most likely to interfere with this motion are the pectorals and the latissimus dorsi and teres major. Spasm or incoordinate contraction in these muscles will interfere with abduction of the arm. Therefore care must be taken that spasm has been released from the adductors. Incoordinate action in the elevators of the shoulder, particularly the trapezius, should also be avoided so that scapulo-humeral abduction is carried out as a pure motion by the deltoid.

Adduction of the Shoulder. — The pectoralis major, latissimus dorsi and teres major perform this function. Their insertion is into the upper humerus anteriorly and posteriorly. Treatment is again carried out in the supine position. Greatest attention is paid to the insertion of the pectoralis major. The same grip is used as in abduction and movement is carried out coordinately following abduction. After the arm has been abducted by the deltoid the patient is requested to relax and then transfer his attention to the insertion of the pectorals. Adduction is then performed by carrying the arm from the abducted position to the side of the body. Spasm of the deltoid or trapezius will interfere with this motion.

Forward Flexion of the Shoulder. — This motion is carried out by the coracobrachialis in combination with both portions of the biceps and the anterior portion of the deltoid. The insertion used for teaching purposes is the insertion of the coracobrachialis just below the middle of the medial margin of the humerus. The supine position is used with the technician grasping the extended elbow. The patient's forearm rests against the technician's forearm and the technician's other hand is placed on the upper surface of the shoulder. The technician lifts the arm forward and upward. Spasm in the latissimus dorsi, teres major and pectoralis major will interfere with this motion. Incoordinate contraction in the pectolaris major must be carefully avoided.

Backward Extension of the Shoulder. — This motion is accomplished by the teres major, the latissimus dorsi and the posterior portion of the deltoid. The insertion used for training purposes is the insertion of the teres major into the ridge below the lesser tuberosity of the humerus. The patient is placed in the prone position. The elbow is grasped by the attendant and the arm brought backward and upward. This is usually carried out with the scapula drawn toward the midline. Spasm in the pectoralis major, biceps and coracobrachialis especially interferes with this movement.

Flexion of the Elbow. — Flexion of the elbow is carried out by the brachialis and biceps with the assistance of the brachioradialis and the pronator teres. The insertion used for training is that of the brachialis into the tuberosity of the ulna. The arm is slightly abducted and the elbow of the patient is supported in the palm of one hand of the technician. The forearm is supported with the other hand. Spasm in the triceps interferes with this motion. Incoordinate movements of the shoulder muscles, particularly the elevators of the shoulders and the pectorals should be avoided.

Extension of the Elbow. — Since the triceps must be moved from its normal resting length before a useful contraction can occur the elbow must be flexed partially before extension is carried out. The muscles accomplishing extension are the triceps brachii and anconeus and the insertion of the triceps into the olecranon is stroked by the technician who grasps the extremity in the same manner as when training the flexors. The elbow is then extended. Spasm in the biceps interferes with extension of the elbow.

Pronation and Supination of the Forearm. — Supination of the forearm is carried out by the brachioradialis, the supinator and the biceps. With the elbow flexed at 90 degrees, the insertion of the biceps into the bicipital tuberosity of the radius is pointed out to the patient. When the elbow is in the extended position the attachment of the supinator to the dorsal surface of the radius is used.

Pronation is performed by the pronator teres and the pronator quadratus. With the elbow flexed at 90 degrees, the insertion of the pronator teres into the lateral surface of the radius is used. When the elbow is in extension the attachment of the pronator quadratus to the volar surface of the forearm near the wrist is pointed out.

The patient is placed in a supine position. The hand is grasped by one hand of the technician as though shaking hands, the forearm is grasped with the other hand. Supination is carried out first and then pronation. Spasm in the supinators will interfere with pronation and vice versa. Incoordination must be carefully avoided and attempts at substitution of other muscle groups must be stopped at once.

Dorsiflexion of the Wrist. — The muscles that perform this function are the extensor carpi radialis longus and brevis and the extensor carpi ulnaris. The insertion of these muscles into the bases of the metacarpals is pointed out. The hand is grasped with the palmar surface of the four fingers of the technician in the palm of the patient's hand. Spasm in the flexor surface of the forearm will interfere with this motion and incoordination in the form of attempts of the finger extensors to perform this function is particularly to be avoided.

Volar Flexion of the Wrist. — Proceeding from the dorsiflexed position, the insertion of the flexor carpi radialis and the flexor carpi ulnaris to the bases of the metacarpals is pointed out and wrist flexion performed. The finger flexors are not allowed to assist this motion. Spasm in the extensor muscles of the forearm will interfere with this motion.

Radial Deviation. — Radial deviation of the wrist is performed by the extensor carpi radialis longus and brevis and the flexor carpi radialis working together. Their attachments are pointed out as before and the motion performed.

Ulnar Deviation of the Wrist. — This is carried out by the flexor carpi ulnaris and extensor carpi ulnaris. The same procedure is performed.

Extension of the Thumb and Fingers at the Metacarpo-phalangeal Joints. — This motion is carried out by the extensor pollicis longus, extensor digitorum communis, extensor indicis proprius and the extensor digiti quinti. The patient is placed in a supine position on the table with the hand in pronation upon the table at the side of the patient. The thumb and index finger of the technician's right hand grasps the sides of the tip of the thumb and each finger in turn. For extension of the metacarpo-phalangeal joint, the points of attachment at the 1st phalanx of the thumb and the first phalanx of the 2nd to 5th fingers are pointed out. Incoordination in the form of contractions of the wrist flexors and extensors should be particularly avoided.

Flexion at the Metacarpo-phalangeal Joints. — While each finger is held in the position of hyperextension as just described, the technician directs the

patient to transfer his mental effort to the palmar surface of the thumb and fingers, and brings them back to the table in turn. Muscles receiving attention are the flexor pollicis brevis and lumbricals.

Flexion and Extension at the Metacarpo-phalangeal and Interphalangeal Joints of the Fingers. — With the patient in the supine position, but with the hand raised from the bed, the technician grasps the finger or fingers at the base of their distal joints and folds them rhythmically into the palm. The muscles that perform this action are the lumbricals, flexor digitorum profundus and flexor digitorum sublimis. From the position of flexion of all the joints the technician unfolds the fingers. The mind is directed to the ends of the fingers. The muscles used in this action are the extensor digitorum communis, palmar interossei and dorsal interossei.

Abduction and Adduction of the Fingers. — Abduction is performed by the dorsal interossei and abductor digiti quinti. The patient is requested to focus his mind upon each finger in turn, and the technician passively abducts the fingers in turn, away from the midline of the midfinger. While each finger is abducted from the midline the patient is requested to transfer his mental awareness to the palmar interossei. The technician then guides each finger in turn from the position of abduction to adduction by carrying it back to the midline of the midfinger.

Abduction and Adduction of the Thumb. — The same procedure is carried out with the thumb. After pointing out the attachment of the abductor pollicis longus and brevis into the bases of the first metacarpal and the first phalanx of the thumb, abduction is performed. The patient's mental attention is transferred to the point of insertion of the adductor pollicis at the bases of the first phalanx of the thumb and adduction is performed.

Opposition of the Thumb. — The thumb is grasped by the thumb and index finger of the technician. The insertion of the opponens to the first metacarpal is pointed out and the technician passively moves the thumb volarward. It is important that this motion should be performed without accompanying flexion of the terminal joints of the thumb.

The Trunk

The Back. — Muscle spasm has been noted in the back muscles in all cases diagnosed as infantile paralysis, whether actual paralysis was present or not. Since these muscles normally do not contract completely unless first removed from their normal resting length this spasm results in the production of an exaggerated lordosis. Unequal spasm between the two sides results in scoliosis and narrowing and shortening of the affected muscles. Spasm is likely to persist longer in the back muscles than in other muscles. Therefore it is important in the reeducation that this spasm be released as soon as possible and that the muscles be brought to a normal condition.

Spasm in the back muscles by producing rigidity of the spine interferes mechanically with the action of the abdominals and frequently the abdominals are assumed to be weak or paralyzed when in fact the fault lies with the back muscles.

A normal child should be able to bend his trunk in flexion so that the head can touch the extended knees. He should also be able to arch in extension so that a hand can be placed between the lumbar spine and the examining table without difficulty. Side-bending and rotatory movements are also possible through ranges up to 90 degrees. The muscles which attach the trunk to the extremities affect its motions. Short hamstrings prevent a sitting position unless the knees are bent. A tight rectus femoris, sartorius or psoas may pull the anterior pelvis down and cause an exaggerated lordosis. Unilateral tightnesses cause tilts or scoliosis.

The musculature of the back is complex with multiple origins and insertions. This complex arrangement makes it impractical to give in detail all the possible combinations which might require treatment. The exact treatment can be determined only after examination and analysis of the individual case.

The part of the spinal musculature to which most attention is paid is the iliocostalis lumborum with insertions into each of the ribs from the 4th to the 12th. These individual slips depress the ribs and thereby allow the abdominal muscles to relax. The rest of the sacrospinal muscles then can contract and hyperextend the spine. When spine and head are in flexion, the entire group acts to extend the spine to its normal position.

For reeducation, the insertion into the posterior portion of the 4th to 12th ribs at their angles is pointed out. The patient lies in the prone position. The technician stands at the side of the table with one arm under the chest of the patient and the other supporting the knees. The chest and knees are raised from the table simultaneously. Incoordination in the form of unequal contractions on the two sides or portions of the two sides should be watched for carefully. If one side is found to be lagging, the patient's attention should be concentrated upon the weaker side only. The leg corresponding to the weaker side is then raised by the attendant while the patient or another technician raises the head and shoulders from the table. The point where the contraction is expected to occur is pointed out to the patient. Since there are a good many different origins and insertions of these muscles, particular attention must be paid to spasm localized to small areas and if such spasm is discovered it must be treated in order that reeducation may be successful.

The Abdomen. — The abdominal muscles contract within their resting length and flex the trunk forward. The recti draw the thorax downward and bend the spinal column forward. The external obliques draw the thorax downward, bend the spinal column forward and toward the same side and rotate it toward the other side. When the thorax is fixed they elevate the pelvis on the same side. The internal obliques perform essentially the same function except that they rotate the spinal column toward the same side. The transversus abdominis pulls the ribs downward and diminishes the size of the abdominal cavity.

The patient is placed in the supine position. The patient's attention is directed toward the insertion of the muscle in individual areas taking the muscles in the lateral or central groups individually. Motion is assisted by lifting the leg on the side desired and simultaneously raising the trunk. Flexing the head alone does not necessarily produce any effective contraction in the abdominal muscles. Finally an attempt is made to obtain a rhythmic action in all groups by making one active effort, raising both legs simultaneously with the trunk and requesting the patient to allow the trunk to flex forward slowly. Action of the abdominals is inhibited by stiffness or spasm in the back muscles. Since spasm in the back muscles is nearly always present and is usually slow to disappear, abdominal action may be interfered with in this way. In order to demonstrate the power of the abdominal muscles when the back is stiff or in spasm, the patient is requested to take a deep breath and exhale, drawing the lower edges of the ribs downward and compressing the abdomen. Palpation with the technician's fingers will then show whether contraction is present in the various groups.

The Lower Extremity

Flexion of the Thigh. — Flexion of the thigh is carried out mainly by the iliopsoas muscle which consists of the psoas minor, psoas major and iliacus. The insertion is into the lesser trochanter of the femur. It flexes the thigh and rotates it somewhat outward. If the thigh is fixed it bends the lumbar spine

lateralward and forward and the pelvis forward. It is true that the rectus femoris, sartorius and the adductors longus, brevis and minimus, also tend to flex the thigh but they are not primary flexors and therefore an attempt is made to keep them from performing the action when training is given in thigh flexion. The patient is placed in the supine position. The technician stands at the foot of the bed if the patient is a child but may stand at the side if the patient is an adult. The leg is grasped near the knee with one hand and the foot supported with the other hand and the required motion is carried out by flexing the thigh with the knee flexed. The insertion of the psoas into the lesser trochanter is pointed out by touching a spot about 1 to 2 inches below the inguinal ligament at the junction of the medial and middle thirds of the thigh, that is, approximately over the femoral vessels. This spot is definitely medial to the belly of the sartorius and rectus femoris. Incoordination in the form of contractions of the sartorius and rectus femoris must be particularly avoided if the psoas is weak. The adductors and all other muscles must also be kept from contracting. However, when the iliopsoas muscle flexes the thigh it is necessary for the patient to stabilize the pelvis and trunk. This is done by the oblique abdominal group. These muscles may be taught to contract simultaneously in order to establish complete coordination.

The arc of movement to be used is a matter of judgment and experience. If the patient's physical effort fades out or is absent in any particular arc of movement, the treatment is carried out within the arc where physical effort is felt and the arc gradually increased as improvement follows. In cases in which the psoas is extremely weak, the origin of the muscle may be stimulated by having the patient hold his head off the table while flexion of the thigh is being carried out. When this is done active motion may often be detected when it was not observed before.

Extension of the Thigh. — Miss Kenny's concept of the function of the gluteus maximus and other thigh extensors differs somewhat from the usual concept. Thus she says that the gluteus maximus muscle contracts within its normal resting length, but that it has been removed from its normal resting length when the thigh is flexed and therefore the sulcus glutei disappears. Useful action cannot be obtained in this muscle if this condition persists. Therefore care is exercised to return this muscle to its normal resting length so that an even and rhythmic contraction can occur when the thigh is extended. The biceps femoris is supplied with two heads for this purpose: (1) long head from the ischial tuberosity and (2) short head from the linea aspera.

According to Miss Kenny, when the long head contracts, the gluteus maximus is replaced within its normal resting place and allows this muscle to contract fully thus stabilizing the lower limbs on the pelvis. Demonstration that the gluteus maximus contracts within its normal resting length is accomplished by placing the patient prone on the table with legs fully extended; then request a contraction. If next the thigh is flexed and the patient instructed to contract the gluteus maximus it will be found this cannot be obtained without the long head of the biceps femoris first restoring the gluteus maximus to its normal resting length.

Miss Kenny points out that full extension of the thigh means a lengthening of the quadriceps. This lengthening indicates that they are expected to contract, because they have to be lengthened, according to Miss Kenny, before a useful contraction can occur from their normal point of attachment. When the thigh is fully extended, or hyperextended, and the gluteus maximus is in full contraction, the quadriceps are lengthened. When the quadriceps are lengthened the hamstrings contract.

The fibers of the hamstrings, Miss Kenny indicates, are placed immediately below the gluteus maximus and from the position of thigh flexion, assist to restore the thigh to normal alignment, and also restore the gluteus maximus to its normal resting place, allowing full contraction of this latter muscle to stabilize the lower limbs and pelvis to support the body when a step forward is made. When it is noticed that the outer head of the hamstrings is not contracting in unison, it can be understood that the biceps femoris is not strong; therefore, full extension of the thigh with full contraction of the gluteus maximus cannot be satisfactorily obtained. The patient will fail in his efforts. When a person stands at ease the gluteus maximus is not fully contracted; therefore, the biceps femoris is giving support. When an effort is made to step forward and the trunk has to be supported in the forward movement by one lower limb in the position of full extension of that limb, the gluteus maximus is fully contracted within its normal resting place.

Miss Kenny proceeds:*

"From the position obtained by contraction of the iliopsoas muscle, the technician will proceed to restore mental awareness, coordination and function to the first movement from the flexed position, i. e., restoring the thigh to normal alignment upright. The technician will direct the mind of the patient to the first point of attachment of the long head of the biceps femoris and linea aspera, and will slowly replace the limb to the alignment of the body, requesting the patient not to put forth any physical effort to contract any muscle of the body, but informing him that the biceps femoris is contracting and restoring the limb to the correct alignment.

"In order that the body may be stabilized in the upright position certain muscle groups must work in rhythm to stabilize the lower limbs, pelvis and trunk. The gluteus maximus stabilizes the thigh in alignment in the extended position. It will be understood that the abdominal muscles as already described must contract to stabilize the position of flexion of the thigh. Consequently, the opponents, the iliocostales lumborum, must have paid out slack and released the depression of the ribs to allow this to occur. Consequently, when restoration of alignment has occurred stabilization must also be established. Therefore, in unison with the extension, stabilization is necessary. To achieve this the technician will endeavor to restore mental awareness to the muscles that stabilize the body upright that is the iliocostales lumborum and the gluteus maximus working in unison. If the iliocostales lumborum are not attended to rhythm cannot be restored. The ribs are not held firmly. Therefore, the proprioceptive reflexes are not receiving the attention that is necessary to establish the acceptance of the sense of security that is necessary to maintain the body upright."

For reeducation of the gluteus maximus, the patient is placed prone on the table. The technician stands at the side of the table and directs the patient to focus his mind upon the point of attachment of the gluteus maximus to the gluteal ridge of the femur and the first four points of attachment of the iliocostales lumborum. This lower portion of the latter muscle, when contracted, will depress the ribs in the lumbar region and stabilize the pelvis and trunk. The technician passively moves the limbs through the arc of movement and observes whether the action is coordinate. When "mental awareness" and coordination have been restored, the technician starts with the usual routine of muscle reeducation. While the mind of the patient is directed to the points of attachment two passive movements are carried out and then he is allowed physically to attempt the third movement, the limb being supported and the movements assisted until strength is established.

*"The Treatment of Infantile Paralysis in the Acute Stage"—By Elizabeth Kenny. Bruce Publishing Co., St. Paul.

Abduction of the Thigh. — The gluteus medius is the muscle to be trained. The patient is placed in the supine position and the insertion of the gluteus medius to the lateral surface of the greater trochanter near its apex is pointed out. The technician abducts the leg and carries out the usual three motions. Contraction of the gluteus medius is shown by a depression just above the greater trochanter of the femur. Incoordination as shown by movements in other muscle groups should be carefully avoided.

Adduction of the Thigh. — Adduction of the thigh is carried out by the adductor longus, brevis, minimus and magnus, the gracilis and the pectineus. The inner surface of the thigh near the knee is stroked as the insertion. This treatment is carried out in the supine position usually with the knee extended. The technician stands at the foot of the table and carries out the required motions.

Internal Rotation of the Thigh. — Internal rotation of the thigh is carried out mainly by the gluteus minimus. The patient is in the supine position with the knee straight and the entire leg resting upon the table. The insertion of the gluteus minimus to the anterior surface of the greater trochanter is pointed out and the movements are controlled.

External Rotation of the Thigh. — This motion is carried out by a group of six small muscles. The same position is used as for internal rotation. The insertion of the muscles to the back of the trochanter of the femur is pointed out and the movements carried out under direct control.

Extension of the Knee. — Extension of the knee is carried out by the quadriceps femoris which is a group of muscles consisting of the rectus femoris, vastus medialis, vastus lateralis and vastus intermedius. These muscles insert into a common tendon which inserts into the tibial tuberosity on the anterior surface of the tibia just below the knee. The quadriceps comes under the classification of muscles that must be moved from their normal resting place before a satisfactory contraction can occur. Their function is to extend the knee. The patient is placed in the supine position. The technician stands at the side of the table and supports the knee with one hand and the leg with the other. The insertion is pointed out and the knee extended from the flexed position. Particular attention must be paid to preventing incoordinate contractions in the hamstrings and movements of the trunk in attempting to carry out this motion. Muscle setting is condemned because it tends to develop a contraction which does not produce a useful movement as far as extension of the knee is concerned, and the insertion into the tibia may be "alienated" from the patient's mind in this way.

Flexion of the Knee. — Flexion of the knee is carried out by the hamstrings consisting of the semimembranosus and semitendinosus on the medial side and the biceps femoris on the lateral side. The medial hamstrings insert into and below the internal tuberosity of the tibia and the lateral hamstring (biceps) inserts into the head of the fibula and these are the areas which are pointed out when doing muscle reeducation. The patient is placed prone on the table and the knee is flexed to a moderate extent. Further flexion is then carried out with the patient's attention focused upon the insertion of the muscles. It is important that the lateral and medial hamstrings should both contract with equal strength and if one is weaker than the other attention is given that muscle. If the outer hamstring is stronger than the inner, or is more in spasm, there is a tendency to external rotation of the leg at the knee and if the inner hamstrings are stronger there is a tendency to internal rotation. However, external rotation may also be caused by spasm in the tensor fascia lata and by spasm in the lateral head of the gastrocnemius. Internal rotation can also be caused by shortening of the sartorius and spasm in the medial head of the gastrocnemius.

Plantar Flexion of the Ankle. — This motion is carried out mainly by the gastrocnemius and soleus which insert by a common tendon into the tip of the calcaneus. The patient is placed in the supine position and the hand is placed over the sole of the foot with even pressure across the heads of the metatarsals exerted by the heel of the hand. The index and middle fingers are placed on either side of the calcaneus. The patient is instructed to plantar-flex the foot, maintaining even pressure with the sole of the foot against the hand. To reeducate the soleus the knee is held in a flexed position in order to relax the heads of the gastrocnemius and the motion is carried out in this position. In order to reeducate both the gastrocnemius and soleus, the knee is placed in the extended position. If during active motion greater pressure is felt on the inner or outer aspect of the ball of the foot the technician directs the mind of the patient upon the side where the pressure is less. Spasm in the medial or lateral head of the gastrocnemius must be carefully investigated since normal function is impossible if any amount of spasm is present. This can often be seen by abduction or adduction of the heel. Plantar flexion of the foot by the toe flexors and peroneus longus or the tibialis posterior should be avoided.

Dorsiflexion of the Ankle. — The point of attachment of the dorsiflexors, the tibialis anterior and peroneus tertius is pointed out by stroking across the dorsum of the foot. Using the same position as for plantar flexion, dorsiflexion is carried out. The toe extensors must not be used for this motion.

Inversion of the Foot. — Inversion of the foot is carried out by the tibialis anterior and posterior in conjunction, according to the amount of dorsiflexion and plantar flexion to be combined with the inversion. Both muscles are equally important and the posterior tibial must not be neglected.

The insertion of the tibialis anterior into the base of the first metatarsal is pointed out. The center of the arch of the foot is used as the insertion of the tibialis posterior.

Eversion of the Foot. — Eversion of the foot is performed by the peroneus longus, brevis and tertius. The tuberosity of the fifth metatarsal is used for training purposes.

Flexion of the Toes. — The flexor digitorum longus and brevis, and the lumbricals perform this function. The point of the toes is used as the point of insertion. With the patient lying in the supine position each toe individually is grasped between the thumb and the index and middle fingers and the motion is carried out.

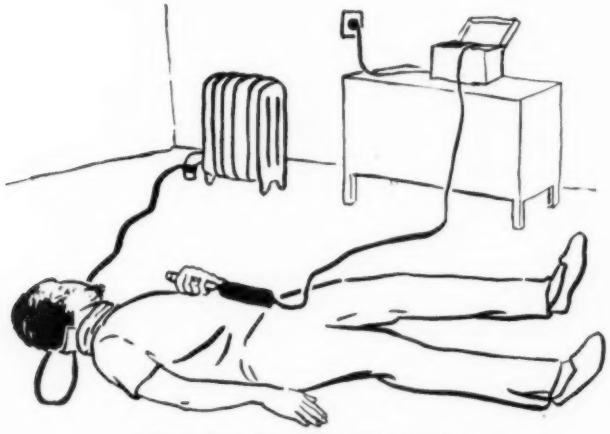
Extension of the Toes. — The extensor digitorum longus and brevis perform this function. The tips of the toes again are used as the point of insertion and the technician grasps the toes in the same manner as for flexion. The great toe is treated in the same manner.

ELECTROCUTION BY HOME TREATMENT DEVICE *

RICHARD KOVACS, M.D.

NEW YORK

"Electric Shock Kills Pastor" was the caption of a story in the New York *Times* of Feb. 20, 1942. The Rev. L. G. W. of a Long Island Universalist Church was found dead in his room the night before. According to information obtained from the office of the chief medical examiner of Nassau County he was found lying on the floor of his bedroom, fully clothed except for his coat. A metal electrode was on the back of his neck, slipped under the collar and held



Electrocution from violet ray apparatus.

in place with a scarf. A wire led from the electrode to the radiator and was wired to the radiator. A rheostat was plugged in a wall socket, the handle of a "violet ray" machine was on the deceased's chest and a circular hollow piece of metal was in his left hand, as illustrated in the accompanying sketch.

The pastor had complained of pain in the back of his neck for some time, but neither the landlady nor an osteopath who had given him a few treatments could supply any other facts.

Autopsy performed by the medical examiner showed acute congestion of the brain, liver and kidneys, follicular hyperplasia of the spleen and first degree burns of the left hand, forearm, back of the neck and anterior portion of the chest.

To reconstruct the sequence of events, the deceased undoubtedly attempted to treat his back pain with the violet ray contraption and, in the mistaken belief that "grounding" would increase the strength of the current and thus the efficiency of treatment, after plugging in the handle of the violet ray outfit, rigged the connection between the radiator and the metal plate on the back of his neck. No better way could have been devised to conduct the alternating current from the return ground through the cardiac area. Hence, as soon as the current flow was started, it caused local burns at the point of entry and at the same time cardiac fibrillation and instantaneous death, without giving the victim any chance to disengage himself from the fatal circuit. Cardiac fibrillation is the usual cause of death in electrocution; because of its very short duration before death

* Reprinted with permission J. A. M. A. 119:498 (June) 1942.

ensues there occur usually no characteristic pathologic changes in the heart itself. The acute congestion in the vital organs is a secondary effect of death by electricity as in asphyxiation.

The object lesson of this tragic happening is obvious. Any sort of self treatment by electric devices — home made or procured from unscrupulous manufacturers or their sales agents — may cause death by electrocution when applied by inexperienced and unskilled lay persons.

2 East Eighty-Eighth Street.

In commenting on this report, the Journal of the Medical Society of the County of New York states editorially: "Physicians have repeatedly warned against self-treatment with diathermy, violet rays and other physical therapy agents. A recent tragedy shows that they do not exaggerate the danger of self-application of powerful modalities by inexperienced persons." — EDITOR.

INJURIES TO MUSCLES

W. H. NORTHWAY, M.D.

SAN FRANCISCO

Muscle tissue may be injured by a direct blow from an external force or by a sudden stretching force from within. The former results in damage to the muscle belly; the latter, in a partial or complete break in continuity of the muscle sheath, the musculotendinous junction, the attachment of the tendon to bone or the tendon itself. If the tendon is ruptured it is generally in an area previously weakened by injury or excessive wear. McMaster[1] has shown experimentally that normal tendon withstands a greater tension than the muscle belly, musculotendinous junction or attachment of the tendon to bone, while Meyer[2] has demonstrated in cadavers that the presence of frayed areas in otherwise normal tendon is not an uncommon finding.

Although injury to muscle tissue by direct violence is a common occurrence in athletic activities and is followed by a definite clinical picture, little mention is made of this injury in current medical literature.

There are numerous case reports on muscle ruptures produced by indirect violence and occurring in areas other than its belly.

The paucity of case reports on muscle ruptures resulting from direct violence is probably accounted for by the fact that the lesion seldom results in complete rupture of a cross section of the muscle belly and that there is ordinarily little separation of the damaged fibers. The injury also with few exceptions responds well to conservative therapy, and surgical intervention is rarely necessary.

Occurrence

Muscle injury by direct violence is a common occurrence in such activities as football, rugby, basketball and soccer. The muscles most frequently involved are the quadriceps femoris, the external and the internal oblique near the attachment to the iliac crest, the gastrocnemius and the biceps brachii.

The site of muscle injury by indirect violence depends on the activity at the time and the age of the patient. Gottlieb[3] found such injuries more

frequent in men than in women and most prone to happen in men over 40. Gilcreest[4] listed the site of the muscle associated with the occupation as follows:

Occupation	Muscle
Load carriers, packers	Neck muscles
Lifters, pitchers	Biceps brachii, triceps brachii
Horseback riders	Adductors of thigh
Boxers, jumpers, dancers, runners, tennis players	Muscles of calf
Sprinters	Flexors of the hip
Broad jumpers	Rectus abdominis
Stevedores, golfers	Back muscles
Drummers	Extensor pollicis longus
Tennis players	Muscles about the elbow

Deaver[5] described an injury to the semitendinosus muscle at its origin on the tuberosity of the ischium as commonly occurring in high jumpers and hurdlers, and I have seen the same injury on several occasions in sprinters.

Mechanism

The mechanism of the injury occurring from direct violence needs no further explanation.

The mechanism caused by indirect violence is not always easy to explain, but in general it is thought to occur in a contracted muscle when the antagonistic group is suddenly brought into action. This evidently occurs through lack of coordination or muscle balance or when a sudden or unexpected movement takes place in response to surprise or for protection. The occurrence of such an injury is aided by a state of fatigue in the muscle substance.

Diagnosis

The presence of a muscle injury should be suspected whenever a direct blow is followed by pain on motion of a muscle over the area. The pain at first may not be severe and does not necessarily cause a cessation of activity. The pain generally becomes worse after a period of inactivity, especially when the muscle is again actively contracted.

The signs present will depend on the degree of injury, but in the majority of cases the area will show swelling on inspection and a palpable swelling associated with tenderness on pressure. The area of swelling and tenderness is generally in the muscle belly and may extend over a considerable portion of the belly.

In the cases of severe injury, in which the blow has produced a break in the continuity of muscle fibers of considerable extent, the break may be seen and felt and increases in size when the muscle is actively contracted.

The gap is soon filled with blood and exudate, and if the injury is examined hours or days later the absence of a gap does not eliminate the presence of a rupture. Careful examination of the muscle while it is actively contracting will be required to rule out this possibility.

The presence of a break in continuity of a muscle from indirect violence should be suspected when during a sudden or forceful muscular act a sharp pain is felt. This pain may be accompanied by an audible snap and a stinging sensation like that from a whip. The limb may feel weak and power-

less, and motion is definitely impeded. This injury when occurring in a sprinter or hurdler may impede locomotion enough to cause him to stumble and fall. If the injury is less severe it may make itself felt by a cramplike sensation in the muscle. This is a warning to the runner to stop, and if he does not, a severe tear may result, the so-called "pulled muscle."

On inspection a break in continuity of muscle tissue is not easily demonstrated unless it is in the muscle belly, and then only if the muscle is superficial. A definite hiatus is therefore not always demonstrable. Its presence of course is positive evidence of a rupture. Swelling and ecchymosis may, however, rapidly fill in the gap, and then a positive diagnosis can be made only by careful examination to detect disturbed muscle function.

Pathology

The damage to muscle following injury by direct violence and that following injury by indirect violence if severe enough will give rise to similar pathologic pictures. There will be a break in the continuity of the muscle tissue somewhere along its course. The ruptured ends of the muscle fibers will retract, and a gap will occur. This gap will soon fill with blood and lymph exuding from torn and injured vessels, widening the space between the muscle fibers and thus replacing the notched area with an area of swelling at the site of injury. The skin and subcutaneous tissue will also show evidences of the extravasation of blood and lymph. Mason[6] reported an injury to the biceps brachii muscle by direct violence seen one hour after it occurred, with a visible gap in the muscle. The patient was operated on two days later, at which time the gap was no longer visible, but still palpable, and the ecchymosis was solely in the subcutaneous tissue, not extending below the deep fascia. There was no evidence of blood clot or effusion between the ends of the muscle fibers, which were clearly divided.

There are undoubtedly all grades of injury to muscle produced by these two forces, varying from a break in continuity of a few fibers, with slight hemorrhage and exudate, to complete rupture, with much exudate. There are also probably variations in which the exudate is large compared to the amount of ruptured muscle and vice versa. Those in which the exudate is the outstanding reaction respond well to the conservative measures of physical therapy, and those in which muscle rupture is the dominant feature respond best to surgical intervention followed by physical therapy.

Treatment

The treatment of muscle injuries should be based on the estimated extent of the pathologic changes. Rupture with retraction of fibers is an indication for surgical suture, encapsulated hemorrhage for aspiration and clot formation for evacuation. All these injuries are accompanied by tissue damage not amenable to surgical measures, and they, along with the injuries for which such measures are not necessary, are indications for physical therapy.

The aim of physical therapy should be, first, the prevention of further extension of the pathologic process initiated by the original trauma, and, second, the return of the traumatized tissue to its normal structure and function as soon as possible.

The prevention of further trauma is enhanced by early treatment. This consists of rest, elevation, compression by a firm bandage and cold or ice compresses.

This type of treatment is most successful during the first six hours following the injury. The length of time during which the procedures are carried out will depend on the extent of the injury. No definite period can

be prescribed. The treatment to fulfill its purpose is continued until the extravasation of fluid initiated by the trauma has ceased.

After the arresting of the process of destruction initiated by the trauma, therapy should be directed to those procedures that will aid nature in bringing about repair as rapidly and with as little permanent change in the tissue as possible. These measures consist of the application of heat, massage and exercise, all of which increase the rate of blood flow through the part. To be of the greatest value they must be started early, hours rather than days after the injury, for organization of the exudate begins at an early date.[7]

Heat. — Heat may be applied by a hot compress, a hot water bag, a hot bath, an electric heating pad, a radiant heater and medical diathermy.

Hot compresses are readily available and simple to apply but have the disadvantage of requiring considerable labor in keeping them at the desired temperature. The compress is usually wrung dry out of boiling water by the aid of a stupe wringer. This consists of a piece of firm fabric, such as canvas, with a tunnel hem provided at each end for the insertion of sticks (broom sticks) to aid in the wringing. The compress is slowly applied to the skin previously oiled with mineral oil or petrolatum. If during the application the patient complains of burning, the compress should be cooled before being left in contact with the skin. The compress is covered with cellophane or oiled silk and this in turn covered by a large turkish towel or blanket. The application of compresses is continued for a period of twenty to thirty minutes and is done several times a day. The compress is changed as often as necessary to keep it warm, which is generally every three to five minutes. Caution is always observed when applying any form of heat to a soft tissue injury, as blistering occurs easily over an ecchymotic area.

The hot water bag is a simple and useful way of applying heat. The bag is filled with water at 115 F. and is placed in a hot water bag cover or wrapped in a turkish towel before being applied to the skin.

An electric heating pad may also be used as a source of superficial heat. It should be regulated to produce a mild comfortable heat, and the patient is warned not to fall asleep with the heating element delivering excessive heat, because blistering may result.

The whirlpool bath is a satisfactory method of applying heat to an extremity.

A distinct advantage in this type of heating is that the operator knows at all times the exact temperature of the heat applied, and the heating is distributed over a large surface area. A safe temperature for a whirlpool bath should range between 106 and 110 F.

Radiant heat may be secured from a luminous or nonluminous source.

Heat delivered by a luminous source is more penetrating than that from a nonluminous source. The heat from both sources, however, is superficial in its action.

Both units should be used at a distance of about 3 feet from the area to be treated, but the distance is always regulated to the comfort of the patient. It is well to repeat that injured soft tissue has a much lower tolerance for heat than normal tissue. Frequent inspection of the treated area is the best safeguard against burns.

Medical diathermy is a useful source of deep heat for office or hospital practice.

The cable is used in the form either of a pancake coil or of three turns of the cable wrapped around the area to be treated. The latter is adaptable only to the extremities. The pancake coil is generally made up of three

turns of the cable with each turn separated ½ to 1 inch from its neighbor. The diameter of the pancake is determined by the size of the area to be treated. At our clinic we believe in having the diameter much larger than the injured area, so that the energy is distributed over a large area.

The pancake coil and the disk are useful for treating large flat surfaces, although the pancake coil can be molded to some extent about a curved surface. The disk is especially valuable for treating areas so sensitive that even the weight of the cable is an added discomfort.

The cable wrapped around an area such as the calf, thigh or shoulder has the advantage of heating more uniformly both ventral and dorsal surfaces but has the disadvantage of being harder to apply, covering a smaller area and perhaps feeling uncomfortably warm at the points where the weight of the limb presses against the cable even though the specified padding is used.

The electric field technic making use of pads, double cuffs or air-spaced electrodes properly placed and spaced on the skin may be used for deep heating of tissue.

The double cuff electrode application is practically limited to the extremities. Both cuffs should encircle the limb completely; overlapping of the cuffs does no harm.

Air-spaced electrodes may be placed in the same manner as the pad electrodes, but as with pad electrodes the efficient method is to have the two electrodes properly applied on the same anatomic surface.

Medical diathermy regardless of technic should always be kept at a level of comfortable heat. Aching of the part is a warning to reduce the power output.

The duration of the treatment varies but in general is twenty to forty minutes. Treatments of longer duration and less intensity are more desirable than shorter periods with intensity to full skin tolerance.

Treatments are usually given once a day, but there is no contraindication to several applications a day if the time and equipment are available.

Massage. — Mssage is useful after the application of heat. The procedure may be used early provided it is carried out properly. One reason it is so seldom prescribed early is that it requires skilful, intelligent execution if it is to aid in the reduction of swelling rather than increase it. The massage should be carried out with the patient in a comfortable relaxed position and in a position which takes advantage of gravity to aid in the procedure. It should begin with superficial stroking which is proximal to the injured part, gradually descends around and below the injury and finally includes the entire extremity. If great enough care is employed, gentle pressure may be applied over the traumatized area. Deep stroking may finally be used above and below but never over the injured area in the early stages. As the injury progresses toward recovery, deeper stroking movements and finally compression may be used. If pain, discomfort or an increase in swelling follows the treatment the procedure has been carried out too strenuously.

In carrying out massage the operator should constantly keep in mind the object of the procedure, namely to increase lymphatic and venous drainage by mechanical action and increase arterial blood flow by capillary dilation through reflex action. Neither end can be accomplished if pain, muscle spasm and discomfort are increased during the procedure.

Exercise. — Exercise should begin early in the treatment of muscle injuries amenable to physical therapy. Exercise increases the circulation, prevents the binding together of muscle, tendon and areolar tissue by fibrous tissue, and prevents the loss of muscle tone. Exercise of a damaged muscle

should begin with a minimum load, without weight bearing, and aided by mechanical support. It should be carried through the greatest arc possible without pain.

Exercise in the treatment of injuries of the rectus femoris muscles, the hamstrings and the adductors of the thigh may be instituted early by removing weight bearing through the use of crutches. It is important to instruct the patient to carry out as near as possible the normal motion of walking in the injured extremity. A cane is not recommended as a walking aid as it does not encourage normal locomotion.

Abnormal gait produces pain and stiffness in other muscle groups and may hinder the return of the patient to normal activity even after the recovery from the original injury. This is especially true in the handling of injuries to athletes.

A firm bandage of the ace type is used to give mechanical support to the muscle. It should extend well above and below the injured area.

Adhesive tape support may be used in place of the ace bandage in certain areas, especially the back and in the lateral abdominal muscles.

As soon as muscle injuries of the lower extremity will permit weight bearing without pain, this should be instituted. Normal walking and running should be encouraged for the regaining of the strength and tone so necessary in the proper functioning of joints dependent on the adjacent musculature. Normal painless function cannot be expected until the muscle tone has been fully restored. Secondary injury may result if the patient returns to work before this has been obtained.

Graduated exercise should play a prominent part in the rehabilitation of patients with muscle injuries of the back. The exercises should be simple at first and progress as strength and mobility increase. It is well to begin the exercises with the patient in the supine and prone positions and to include flexion, lateral bending, straight leg raising of the legs singly and together, hyperextension of the back and hyperextension of the legs singly and together. As the strength of the patient improves, flexion, extension, lateral bending, rotation and flexion with rotation are carried out in the standing position. The final step is the carrying out of the exercises against resistance or a load.

There is little need for passive exercise or graduated muscle contraction by the faradic current in the treatment of muscle injuries amenable to physical therapy procedures alone. Active exercise is to be preferred and can generally be instituted early.

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"Injuries to Joints," by Dr. Northway will appear in the August issue. — EDITOR.

MEDICAL NEWS

Board of Trustees
American Medical Association
Council on Physical Therapy

The Council on Physical Therapy has continued its duties of investigating and reporting on new apparatus offered to the profession for diagnostic and therapeutic purposes, publishing informative articles on reliable and effective physical therapeutic measures and advising research workers in the field. Emphasis has recently been placed on the publication of material considered valuable to those members of the profession engaged in the nation's war effort.

PUBLICATIONS OF THE COUNCIL

The Handbook on Amputations, recently published, contains practical information on the general principles governing all kinds of amputation, sites of election, physical therapy in amputations and mechanics of artificial limbs. The volume has already found favor with the profession. Over a period of three years the Consultants on Artificial Limbs have devoted considerable time and effort to reviewing the literature, gathering facts and opinions and assembling the material in short, concise articles which were first published in *The Journal*. Since this group of consultants was composed of leading orthopedic surgeons and of representatives of the Association of Limb Manufacturers of America, the Handbook is a reliable guide for physicians desiring the latest information on technic of amputation and on the most satisfactory prosthesis. The Council is indebted to the consultants for their untiring efforts.

A Manual on Physical Therapy, the contents of which have been published in *War Medicine* and have been collected in a small handbook, is ready for distribution. It is a short, concise summary of the pertinent facts pertaining to the therapeutic value of physical agents. The Council believes that it will be useful to medical officers in the Army and Navy and to physicians engaged in civilian defense work as well as to the general practitioner. The Subcommittee on Physical Therapy of the National Research Council cooperated in the preparation of this volume.

Apparatus Accepted, a Council publication containing a list of accepted products, has been revised, and copies are available on request to the secretary of the Council.

Articles and reports published under the auspices of the Council included "X-Ray Protection" by Lauriston S. Taylor, Ph.D., "Radiotherapy for Inflammatory Conditions" by A. U. Desjardins, M.D., "Corsets and Backache" by Frank R. Ober, M.D., "The Management of the Cerebral Palsies" by Winthrop M. Phelps, M.D., "Explosion Hazard in Anesthesia," "Interrelationships of the Artificial Limb Manufacturer, the Surgeon and the Patient," "Physical Therapy in Amputations," "Amputation in Congenital and Chronic Disabilities," "Reamputations and Secondary Amputations," "Ion Transfer," "Amputations in Diabetes Mellitus and Peripheral Vascular Disease," "Rehabilitation" and "The Manufacture of Artificial Limbs."

RESEARCH

Grants were awarded through the Council's Committee on Research in aid of research on the following subjects:

A functional examination of respiration in obstructive diseases.

A continuous record of the total daily amount of ultraviolet radiation of wavelentghs 3,200 angstroms and shorter from the sun and the entire sky incident on a horizontal surface, in clear and cloudy weather, as function of the season and the geographic latitude.

A survey of methods used in artificial respiration.

Studies of the physiologic effects of short wave diathermy.

An experimental study of the amplification afforded by hearing aids under conditions of actual usage.

Further research on anesthesia by means of refrigeration in surgery of the extremities.

Further development of method and portable apparatus for clinical determination of blood flow in the arm or leg.

Previous grants have yielded very gratifying results in basic scientific research.

ARTIFICIAL RESPIRATION

Research in the field of artificial respiration, both manual and mechanical, is being continued. The survey of methods used in resuscitating the asphyxiated individual has been prosecuted for two years, and the Council expects to continue it for at least five years.

The investigation and acceptance by the Council on Physical Therapy of apparatus for administering artificial respiration does not constitute a recommendation to abandon manual artificial respiration. In emergency cases, especially those occurring outside medical institutions, apparatus whether inhalator or resuscitator is seldom if ever at the site of the accident. A period of ten minutes to half an hour or perhaps longer elapses before an apparatus arrives. It is of paramount importance that artificial respiration be instituted immediately, and the public should be given instruction on how to administer approved methods of manual artificial respiration such as are described in the American Red Cross First Aid Textbook.

The Consultants on Respirators have aided the Council in its investigation of equipment used to provide artificial respiration over long periods of time such as for patients having poliomyelitis. When an epidemic of poliomyelitis strikes a community,

(Concluded on page 429)

ARCHIVES of PHYSICAL THERAPY

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.·. EDITORIALS .·.

PITTSBURGH EXPECTS YOU

The full program of the 21st Annual Session of the American Congress of Physical Therapy appears in this issue of the ARCHIVES. It is a significant coincidence that the Congress should attain "age" at this critical period of our nation's history and that it should be able to prove its full maturity by a program so wide in scope and so vital in its implications for the success of our all out efforts. Clinicians outstanding in all branches of medicine and not only from diverse parts of the United States but also from Canada and Mexico, members of the Congress and other physicians enrolled in the armed forces, will address this meeting. The topics of the program embrace all important recent advances in Physical Medicine. There will be, in addition to the usual course of instruction, special demonstrations on essential physical therapy procedures, for all those in attendance. The scientific and technical exhibits will display a wealth of research and practical material relating to physical therapy as well as to the general practice of medicine.

The spirited message of the President of the Congress in the June issue of the ARCHIVES asked every member, their technicians and their interested medical friends to attend this meeting. This invitation is now urgently repeated. The fact, that in contrast to cancellations of most other conventions, our meeting will take place, serves as proof that those competent to judge consider it a part of essential war effort. Hence it behooves all those who possibly can do so, to get ready to overcome all potential handicaps of war time traveling, make their reservations for hotel accommodations and for railroad travel at once—if they have not already done so—and to join in our Pittsburgh meeting. It should be an occasion for a patriotic demonstration, for postgraduate education and for receiving inspiration and for enjoying relaxation by mingling with all those vitally interested in our common cause.

PHYSICAL THERAPY EDUCATION TO THE FRONT

The entrance of the United States into the Second World War is affecting the field of physical therapy from several angles. The value of the extensive use of physical medicine for the immediate care as well as for the rehabilitation of the wounded and otherwise disabled having been fully established in the First World War, in facing the present conflict the manning of general and base hospitals by physicians and technicians adequately trained in physical therapy became an immediate problem. To fulfill this demand, special training courses have been inaugurated for Army medical officers selected to be directors of physical therapy departments, and a list of civilian physicians qualified in physical therapy has been set up with the Army. For the information of the medical departments of the United States Army and Navy a compact *Manual of Physical Therapy* has been issued by the Council on Physical Therapy of the American

Medical Association and the Subcommittee on Physical Therapy of the Division of Medical Sciences of the National Research Council. New training courses for physical therapy technicians have been established as well as additional emergency courses.

Recognizing the need for basic training in physical therapy for the medical profession itself, leading educators are now calling attention to the responsibility of medical schools to teach physical therapy. Dean Cary[1] states in an article sponsored by the Council on Physical Therapy, "Our duty to medical students and the medical profession will not be fulfilled until each medical school formulates a teaching program in physical therapy. We owe this duty likewise to the public because physical therapy is part of the art of healing." Piersol[2] said before the Section of Medicine of the American Medical Association, "A survey of the curriculums of undergraduates as well as graduate medical courses reveals the fact that, if taught at all, but little time is devoted to the various aspects of physical therapy and that at best the courses available to students of medicine are inadequate and superficial. The average physician, therefore, approaches the practice of medicine knowing little about one of the oldest and most useful branches of therapeutics."

There is every reason to believe that such eminent counsel and the new surge of active expansion of physical therapy during and after this world wide holocaust, will finally overcome the vicious circle still existing in many medical colleges: no physician qualified in physical therapy — no adequate physical therapy department — no teaching in physical therapy. Under present day circumstances there is no excuse for the continuance of any of these negative conditions. At the recent meeting of the consultants on Education of the Council on Physical Therapy, ways were discussed to properly approach every medical college still lagging in physical therapy teaching and to offer them assistance for establishing an acceptable course of instruction.

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THE BRITISH JOURNAL OF PHYSICAL MEDICINE AND INDUSTRIAL HYGIENE

Beginning with its May-June issue of 1942, our British contemporary has increased its scope by including the fields of rehabilitation and industrial hygiene, which have been always adjacent to physical medicine. A series of cogent articles by distinguished medical men, including the Rt. Hon. Lord Horder, Physician-in-ordinary to H. M. the King introduces the new policy. The typography of the Journal has been changed to enable publication of more material within the same space and names of leaders in the field of industrial medicine will be added to the Honorary Advisory Editorial Board The ARCHIVES OF PHYSICAL THERAPY extends to our British colleagues its sincere felicitations for the success of their worthwhile labors. The editors and publishers of the *British Journal of Physical Medicine and Industrial Hygiene* are showing real enthusiasm and sacrifice in "carrying on" with their offices removed from London, with practically no advertising, and with the difficulty of obtaining suitable papers from medical men doing heavy war duty.

Medical News
(*Continued from page 426*)

available equipment is recommended for prolonged treatment.

ULTRAVIOLET RADIATION

For several years the Council on Physical Therapy have given consideration to ultraviolet generators designed for germicidal purposes. Studies have been made of the effect of these lamps in schoolrooms, hospital operating rooms and nursery cubicles. Available critical evidence indicates that the ultraviolet radiation from these lamps will destroy bacteria, provided the air borne germs come within direct range of the lethal ultraviolet rays. Bacteria lurking in the shadows or under opaque objects will not be affected; in fact, thin films of grease, oil and other organic and inorganic matter, even though transparent, will protect the bacteria from destruction. Cross infection may be eliminated only under certain conditions. For example, babies surrounded by mechanical barriers and "curtains" of ultraviolet radiation may be protected from cross infection, provided care is exercised to avoid contamination by some other means such as careless nursing practice. The Council's report "Requirements for Ultraviolet Lamps for Disinfecting Purposes" contains further information on this subject.

RADIO INTERFERENCE

The Council has continued its cooperation with the Federal Communications Commission in an effort to solve the problem of radio interference caused by diathermy apparatus. Three frequency channels, 13,665, 27,330 and 40,995 kilocycles per second, have been tentatively assigned, although the tolerances of these frequency channels have not been fixed.

AUDIOMETERS AND HEARING AIDS

Work on an acceptable procedure for estimating percentage loss of hearing has progressed, and the Council in cooperation with its Consultants on Audiometers and Hearing Aids expects to make a definite report in the near future. Careful investigations have been made of the various hearing aids and audiometers on the market, and reports have been published.

EDUCATION

The Consultants on Education, under the supervision of the Council, have contributed an important service in the dissemination of reliable information on the true values of physical therapy in the practice of medicine. It is gratifying to note that several schools of medicine which formerly had no undergraduate course in physical therapy now include courses in their curriculums as a result of the efforts of the Council on Physical Therapy.

EXHIBITS

The Exhibit on Lame Back was repeated at the Cleveland session in 1941 and was very successful. It will be presented again in 1942 with additional material. The Council provided exhibits during the year at the meetings of the American Academy of Opthalmology and Otolaryngology and the American Congress of Physical Therapy.

INVESTIGATIONS AND REPORTS

The Council has continued its investigation of physical therapy apparatus and has published reports of forty-five acceptances and of nine rejections. Most members of the medical profession probably are not fully aware of the tremendous amount of material consisting of reports, articles, advertising and correspondence which the members of the Council are obliged to review during the year. The members of the Council on Physical Therapy receive no remuneration for their services but give freely of their time and energy.

Cordial cooperation has been maintained with the National Bureau of Standards, the American Standards Association, the Food and Drug Administration and the Federal Trade Commission.

SUMMARY

The Council on Physical Therapy has continued its work of investigating apparatus offered for diagnostic and therapeutic purposes and reporting its decisions in *The Journal*.

During the year the Handbook on Amputations, the Manual on Physical Therapy and numerous articles on physical therapy were edited and published, and Apparatus Accepted was revised.

Several grants in aid of research have been made. Research in the field of artificial respiration is being continued and expanded. Specifications for ultraviolet lamps designed for disinfecting purposes have been compiled and adopted.

Cooperation has been maintained with the Federal Communications Commission in an effort to solve the problem of radio interference caused by diathermy apparatus.

Work has progressed on an acceptable procedure for estimating percentage loss of hearing. Hearing aids and audiometers have been investigated and reports published.

Through the efforts of the Council's Consultants on Education, courses in physical therapy have been included in the curriculums of several schools of medicine that were without undergraduate physical therapy instruction.

Exhibits on physical therapy were presented at two medical meetings.

Forty-five acceptance reports and nine reports of rejection have been published, while many more pieces of apparatus have been investigated.

Correspondence relating to physical therapy apparatus has become a major part of the Council's work. — *Reprinted with permission, J. A. M. A.* **118**:*1467 (April 25) 1942.*

Health Clinic Planned

Dr. Everett Shank, Chairman of the Health Education Committee, has just announced a YMCA Health Service Clinic to be held August 9 to 14 inclusive in the Dayton YMCA.

The purpose of this clinic is to review fundamental theory of anatomy, physiology, business management, promotion, and professional ethics as well as to give practical work in massage, corrective exercise, and recreational games. In these days of decreasing personnel it may be necessary for health

service operators in YMCA's to take over certain phases of the program formerly handled by physical educators and intensive basic training is necessary.

Roland E. Bevan, athletic trainer at West Point, formerly at Dartmouth, will discuss "The Care of Athletic Injuries," and Dr. Walter A. Reiling, special lecturer at the University of Dayton, will present fundamental anatomy and physiology.

Dr. H. Worley Kendell, for the past 12 years in charge of the Miami Valley Hospital department of Physical Medicine, has arranged for a special demonstration and lecture at the hospital. Among other things he will explain the fever therapy machines that have been developed under the direction of Dr. Walter Simpson.

Dr. George T. Stafford of the University of Illinois has been secured for corrective and remedial exercises and some game instruction.

Complete information and application blanks may be secured by writing direct to Harold C. Pedicord, Manager, Health Service Section, YMCA, Dayton, Ohio.

Corps Area Surgeons

First Army: Col. Raymond W. Bliss, Fort Jay, N. Y.

Second Army: Col. Frank H. Dixon, Memphis, Tenn.

Third Army: Col. John Dibble, San Antonio, Texas.

Fourth Army: Col. Condon C. McCormack, San Francisco.

First Corps Area, Boston: Col. J. J. Reddy.

Second Corps Area, Governors Island, N. Y.: Col. Charles M. Walson.

Third Corps Area, Baltimore: Col. Robert C. McDonald.

Fourth Corps Area, Atlanta, Ga.: Col. Sanford W. French.

Fifth Corps, Area, Fort Hayes, Ohio: Col. Edgar C. Jones.

Sixth Corps Area, Chicago: Col. Joseph E. Bastion.

Seventh Corps Area, Omaha: Col. Herbert C. Gibner.

Eighth Corps Area, Fort Sam Houston, Texas: Col. W. Lee Hart.

Ninth Corps Area, Fort Douglas, Utah: Col. Harry R. Beery.

Hospital for Treatment of Industrial Injuries

The first of a new type of hospital—one specialized for the treatment and rehabilitation of persons injured in industry or road accidents—has been established. In the great industrial city of Birmingham the Queens Hospital, an important general hospital and medical school for a century, has been specialized for this purpose. The process of conversion was begun nearly a year ago but is not yet completed. In the first nine months 1,500 inpatients and 11,000 outpatients were treated in this accident hospital. The latter are now attending at the rate of 350 a week. The expenditure of the hospital is estimated at $300,000 a year and is to be met by contributions from the Ministry of Health, the Hospital Contributory Association, the Birmingham Corporation and a subsidy from industry.

All hospitals in industrial areas of course afford service to industry, but the Birmingham Accident Hospital, in addition to being entirely a casualty service, is intended to be a training center for industrial nurses and ambulance and first aid workers. It will be connected with Birmingham University as a teaching center for undergraduate and postgraduate medical students. It will also be a center for industrial medical officers attached to the various works. Regular meetings with the medical staff of the hospital will be held and cases will be discussed. It may become a center from which medical officers are recruited. As the full title, "Birmingham Accident Hospital and Rehabilitation Center" shows, the patient will be treated until they are fit to return to work. Vocational training centers may be established in the large factories in association with the hospital for those who cannot resume their former occupation. — Reprinted with Permission, J. A. M. A., "Foreign Letters," **119**:576 (June 13) 1942.

Green-Lips Circulation Test May Tell When to Amputate

A green-lips test which in an adapted form may help the Army Surgeon who has to decide whether or not to amputate a frozen or gangrenous foot to save a soldier's life, was demonstrated by Dr. Kurt Lange and Dr. Linn J. Boyd at the New York Medical College, Flower and Fifth Avenue Hospitals in New York.

The test is made with the dye, fluorescein, which gives off a greenish-yellow color under ultraviolet light.

By injecting the dye into a vein of the arm and shining an ultraviolet lamp on the patient's lips, the doctor can tell how fast the blood is flowing through the patient's body by the speed with which his lips turn green. The test is made in a slightly darkened room.

In some cases, such as gangrene and incarcerated intestines, it is important for the doctor to know whether any blood is getting through to the sick part of the body. Successful adaptation of the green-lips test, originally devised by Dr. Lange and Dr. E. Wollheim in Germany, for these other conditions is now reported by Dr. Lange and Dr. Boyd in the current issue of the Medical Clinics of North America.

Instead of turning the ultraviolet light on the patient's lips after injection of the dye into his veins, the light is turned onto his foot or whatever part of the body is suspected of being without adequate blood supply and therefore dying. In the case of incarcerated intestines, the surgeon can inject the dye during the operation, have the operating room lights lowered and shine the ultraviolet directly onto the suspected tissues. The presence or absence of the green fluorescence within a few minutes tells him whether or not that tissue needs to be removed.

The dye is safe, inexpensive and easily available, Drs. Lange and Boyd point out.

In testing speed of blood flow, the green-lips showed that in normal grownups, the blood circu-

lation time is 15 to 20 seconds. Patients with heart disease had circulation times varying from 20 to 68 seconds. Those with overactive thyroid glands had a very short circulation time, seven to 10 seconds, while those with underactive thyroids had a prolonged circulation time of 21 to 34 seconds.—*Science News Letter.*

Respirators

The National Foundation for Infantile Paralysis has compiled from records available April 1, 1942 a list of adult cabinet type respirators or "Iron Lungs." The list contains only those respirators which have been approved by the Council on Physical Therapy of the American Medical Association. These standard cabinet type respirators are not to be confused with other machines such as chest type respirators, resuscitators, inhalators or aspirators.

The National Foundation hopes that the list will prove helpful in any emergency and in epidemics of infantile paralysis. It also may be used as a guide for those contemplating the purchase of an "Iron Lung" as it readily shows the accessibility of respirators for any given community. Should the purchase of a respirator be considered, we suggest such a step be discussed with leading persons in the medical profession and a careful study be made with respect to local hospital facilities, number of respirators within transportable distance, availability of competent medical supervision, total population to be served, previous incidence of cases needing respirator treatment and whether the initial cost and upkeep warrant such a purchase.

The Foundation owns a number of adult cabinet type respirators or "Iron Lungs" which can be loaned to hospitals or communities during infantile paralysis epidemics or emergencies. These are supplied on the basis that the Chapter or some other local agency pay all transportation costs, make necessary repairs and make certain that trained personnel is placed in charge of each case.

These loan respirators are not intended to meet all demands but are merely to supplement machines already owned in any given area. Our experience has shown that most owners of respirators freely cooperate in making their machines available on loan when needed, but in an emergency, if you are unable to borrow a machine, telephone or telegraph your needs to the National Foundation.

The Medical Advisors of The National Foundation believe that a well balanced geographical distribution of respirators or "Iron Lungs" would best serve the interests of all of our people. The Foundation is prepared to render any assistance that it can in regard to respirator problems.

The publication, No. 24B may be obtained by writing to the National Foundation for Infantile Paralysis, Inc., 120 Broadway, New York, N. Y.

Dr. Hench Honored

Dr. Philip S. Hench of the Mayo Clinic has been awarded the Heberden Medal for 1942 by the Heberden Society of London "in recognition of his outstanding contributions to knowledge and progress in rheumatic diseases." The society was founded in 1936.

Dr. Mock Honored

Dr. Harry Mock of Chicago was one of a group of doctors of medicine, all graduates of Rush Medical College who was awarded an honorary citation in special recognition of achievement in his special field. Dr. Mock is an associate professor of surgery, Northwestern University Medical School.

Dr. Schmidt Advanced

Dr. William H. Schmidt has been appointed associate professor of physical therapy at Jefferson Medical College of Philadelphia.

Hospital to Sponsor Unit for Kenny Treatment

Drs. James E. Dyson and Dwight C. Wirtz, Des Moines, are establishing a private hospital pavilion for the treatment of infantile paralysis by the Kenny method under the auspices of the Iowa Lutheran Hospital, Des Moines.

BOOK REVIEWS

THE MEDICAL APPLICATION OF THE SHORT WAVE CURRENT. By *William Bierman*, M.D., Attending Physical Therapist, Mount Sinai Hospital, New York City; Assistant Clinical Professor of Therapeutics, New York University College of Medicine. With a Chapter on PHYSICAL AND TECHNICAL ASPECTS. By *Myron M. Schwarzschild*, M.A., Physicist, Beth Israel Hospital, New York City; Instructor of Physics in Radiology, New York University College of Medicine. Second Edition. Cloth. Pp. 345 with 87 illustrations. Price, $5.00. Baltimore: A William Wood Book. The Williams & Wilkins Company, 1942.

The medical and allied professions undoubtedly will welcome this second edition because just as the earliest formal reviews lauded this monograph as a work of exceptional character, so now they must confirm this opinion with greater confidence. That it has qualified to enter the ranks attained by permanent or lasting contributions is largely due to the fact that in quality and quantity it satisfied the special needs of discerning and conservative groups. Of major interest is not so much whether this new edition has been reduced in size but rather how in its revision it continues to add to the knowledge and better understanding of the fundamentals of short wave medical currents for application in a wide terrain of clinical entities. In a great measure this objective has been successfully achieved and only in an academic sense is there reason to challenge a few negations concerning issues that with passing time still call for explanation to account for clinical results obtained by certain colleagues here and abroad with circuits that are inherently non-thermic in effect.

Essentially this monograph is so rich in detail and impressive in data that it arouses not only unbounded admiration for its scholarship but like respect for the meticulous efforts entailed in their correlation. By comparison no other publication to date has, so far as one is able to ascertain, delved so deep or so widely into multi-lingual sources for an evaluation of topics, technics and the like, for the sole purpose of broadening the scope of a treatise restricted to the medical usage of short wave currents. Without intention of disparaging even in the least degree other competitive and valued contributions, one might correctly assume that this work has in its broadest aspect become the *liaison* expositor of international opinions pertaining to this discipline as exemplified by the citation of approximately 680 references, which the author reviews and brings down to date. Stylistically every chapter is objective and classically severe in viewpoint and permits the reader the logical choice of conclusions drawn from the richest selection of balanced evidence. The term "balanced evidence" approaches closest to the description of the extraordinary amount of facts introduced into the discussions of the number of topics that round out this book.

Certainly, it is difficult to conceive of a more cogent exposition on the physics, physiologic action and therapeutic possibilities to be achieved by short wave current for topical and systemic diseases than as here presented by Bierman. The new chapter on Fever Therapy reflects credit to the author for saying so much in so little space and accordingly tends to amplify the exposition on the extension of thermotherapy. The change in the character of the illustrations from halftones of original photographs to zinc etchings also helps to make clearer the technics most suitable and desirable in practice. In contrast one cannot help view with some degree of uncertainty the author's conviction that the only curative action of short wave currents stems from its thermal action. In order to have him strike a more scientific balance in his next edition, we recommend to his attention, among others, the study of the complete text of the reports by Professor Vittorio de Cigna of the Royal University of Genoa who employed an electrostatic field of multiple short wavelengths, and the recent report by Professor Carlo Guarini of the Royal University of Naples, who used a wattage strength so insignificant as to make one question the nature of the current that produced clinical changes of a most important character.

Unquestionably the literature is richly represented in these pages, but one hopes the author will bear with the reviewer for raising a doubt as to the inclusive interpretation that thermogenesis is the motivating factor connected with the absorption of short wave current in living tissues. The greatest service will be rendered students of this field of practice when the author will explain the universal confusion, errors and misinterpretations that have crept into contemporary literature, instead of listing names upon names who have encountered opposite results from apparently the same approach in similar studies. What is especially needed at the moment is the pointing out where the research workers lose their way and where or why the clinician adopts the speculative for that of the scientific method in dosage and technic in order to obtain uniform results in laboratory and clinical studies.

ATHLETIC INJURIES: PREVENTION, DIAGNOSIS AND TREATMENT. By *Augustus Thorndike*, M.D., Surgeon in the Department of Hygiene, Harvard University, Boston. Second Edition. Cloth. Price, $3.00. Pp. 216, with 105 illustrations. Philadelphia: Lea & Febiger, 1942.

This is the second edition of a valuable book by a recognized authority on athletic injuries. This kind of book takes on added significance in war time when the question of physical fitness in the Armed Services and among the civilian population is of paramount

importance. The development of amateur and professional athletics has always been connected with a certain amount of risk as to injury. It is therefore important that our athletics should be supervised and guided by medical men, and not by professional athletes. If our present program of physical fitness in our Armed Forces has not already resulted in more harm than benefit, there is certainly a real danger in turning over such a program to professional athletes. It is a well-known fact that the care of athletic injuries in our schools and colleges has been in the hands of trainers who owed their positions to the coach or to the alumni rather than to any professional training. This is so much more to be deplored because after leaving school the former student will continue to seek advice and treatment from the trainers in our clubs and gymnasia rather than turn to his family physician. It is therefore a pleasure to read a scientific discussion such as Dr. Thorndike's on the prevention, diagnosis and treatment of athletic injuries. The book is divided into three parts. In Part I, is discussed the prevention of injuries in athletics and has added many recent developments. In Part II, the more common type of athletic injuries are discussed. The chapters on sprains, strains and contusions will dispel a lot of confusion on these subjects, even among medical men who are apt to use these terms loosely and without definite distinction. In Part III, regional injuries are discussed particularly those received in contact games. In the last chapter, physical therapy is discussed by Dr. Arthur Watkins, who is an authority on this subject. This chapter is short in relation to the book and it is to be regretted because of the extensive part physical therapy plays in the treatment of athletic injuries. The statistics and illustrations add much to the book and it should be a primer for anyone connected with physical fitness programs. We have too few scientific books on this subject and this one is to be recommended to every one interested in athletics and should be read by all those who supervise or treat athletic injuries.

THE 1941 YEAR BOOK OF OBSTETRICS AND GYNECOLOGY. OBSTETRICS. Edited by *Joseph B. De Lee*, A.M., M.D., Professor of Obstetrics, University of Chicago Medical School, etc. GYNECOLOGY. Edited by *J. B. Greenhill*, B.S., M.D., F.A.C.S., Professor of Obstetrics and Gynecology, Loyola University Medical School, Chicago. Price, $3.00. Cloth. Pp. 704 with 114 illustrations. Chicago: The Year Book Publishers, Inc., 1942.

With traditional thoroughness this "Year Book of Obstetrics and Gynecology" is again presented by its well known editors. Under the heading of "Pregnancy" many interesting physiologic studies made during and after gestation are summarized, as are the latest histologic investigations, blood studies and chemistry, the newer methods for the diagnosis of pregnancy, such as the Falls-Freda-Cohen skin test, and refinements in the older Aschheim-Zondek and frog tests. The material on roentgen pelvimetry and vitamin E therapy in the literature of the past year indicates that the average reader is certain to increase his information concerning these items. In the space devoted to toxemia, De Lee's beginning statement "The more we learn about it the less we are sure to know"—is contradicted by the many instructive and interesting articles he summarized for the reader. Many good articles of the past year on anesthesia and analgesia indicate that investigators are striving to improve methods that relieve the pain of childbirth. Some surgeons found that sterilization when necessary may be easily accomplished during the early period of puerperium with local anesthesia. Suppression of lactation by the use of stilbesterol or testosterone proprionate has been successfully carried out by several authors. Much space is devoted to the problems of the newborn. The section on obstetrics closes with many articles on miscellaneous related subjects. The section on gynecology is complete. The practitioner will find many new concepts that will be of considerable aid. It is pointed out in one article that mineral oil may be harmful in irritating the rectum and interfering with vitamin absorption. The editor of this section includes an abstract of his own articles on office gynecology. On this subject he is an authority and has written a fine book. This section also includes consideration of various aspects of the sterility problem, many illustrated articles on operative technic and articles on infections of the female organs, menstrual disorders, gynecologic endocrinology and neoplasms. Again the trenchant comments by both editors are stimulating additions to the reading material. The costly inclusion of many illustrations leaves the reader indebted to the publishers. The reviewer in his enthusiasm for this publication would rename it "The Book of the Year on Obstetrics and Gynecology."

DIETETICS FOR THE CLINICIAN. By the late *Milton Arlanden Bridges*, B.S., M.D., F.A.C.P., Director of Medicine, Detention, Rikers Island and West Side Hospitals, New York; Consulting Physician, Seaview Hospital, Staten Island, New York; Department of Education, New York University, New York; Assistant Professor of Clinical Medicine and Lecturer in Therapeutics and Nutrition, New York Post-Graduate Medical School of Columbia University; Associate Attending Physician and Chief of Diagnostic Clinic, Post-Graduate Hospital, New York; Fellow of the New York Academy of Medicine. Fourth Edition, Thoroughly Revised. Pp. 960. Buckram. Price, $10.00. Philadelphia: Lea & Febiger, 1941.

This new and revised volume is the result of wide appreciation and acceptance of the former editions by the medical profession. As is stated in the preface, "No effort has been spared to make this posthumous issue a valuable source of practical information and instruction in the application of dietary principles to the maintenance of physical vigor and to the healing of the sick." That this object has been attained there can be no doubt, as one reads the practical application of dietetics from some twenty contributors, who are outstanding specialists in their fields. From the opening statements on the mechanics of digestion to the final pages of the excellent bibliography, there is found a wealth of invaluable material, much of which is not readily accessible in any other volume.

The first nine sections of Part I include such subjects as vitamins, acid-base balance, availability of nutritional factors in food after cooking, grading, freezing, etc. The portion with most appeal to the practicing physician will undoubtedly be Part II. Almost 400 pages are devoted to the dietary management of diseases. Not only are menus carefully planned, but the arrangement of diseases alphabetically facilitates the finding of specific directions quickly and easily. Some of the fields covered are surgery, obstetrics and gynecology, proctology, dermatology, ophthalmology, cardiology and urology. The discussions of the management of obesity, cholecystitis and diabetes are especially good. The treatment of lead poisoning, hypertension and cirrhosis of the liver could have been enlarged on. In the appendix are found many new tables not in the previous editions. Especially helpful are the tables of "Mineral Data on Foods" and "Vitamins in Foods." The latter is excellent.

The value of this book is in proportion to one's appreciation of the close relation of diet to health and disease. The recent advancement in the field of dietetics has been phenomenal and it is now assuming its rightful place in the armamentarium of the medical profession. This text supplies accurate information on how, why and when to prescribe a diet for the disease at hand. We recommend it highly.

PAIN. By *Thomas Lewis*, M.D., F.R.S., Physician in Charge of Department of Clinical Research, University College Hospital, London; Fellow of University College, London. 26 Figs. Pp. 192. Price, $3.00. New York: The Macmillan Company, 1942.

The latest volume of the world-renowned physiologist Sir Thomas Lewis deals with the subject of pain, which is of much interest to all physicians practicing physical therapy; it sets out to review the modern ideas of human pain and bring the recent work of the author's laboratory into perspective with other observations. Most of the evidence, for obvious reasons, is drawn from experience with human pain rather than from that with animals. The first chapter describes the pain-sensitive tissues, the skin, the mucous membranes, the deeper-seated tissues and the organs in body cavities; the second chapter describes the anatomic basis of pain; in the third chapter the types of pain are discussed. The author purposely refrains from attempting to define pain. He recognizes two systems of pain nerves in the skin and describes the "double response," the first as touch, the second as pain. Lewis has for many years made path-finding studies of the chemical factors underlying local redness and tenderness following injury; now he has coined a new term, that of "nocifer" nerves, to denote those associated with local defense against injury. Subsequent chapters deal with "Cutaneous Tenderness and Nerve Injuries," "Pain and Tenderness in Ischemic Muscle" and "Excitants of Pain Nerves." In the chapters on "Referred Pain" and "Referred Manifestations of Somatic and Visceral Origin Compared," the author concludes that the identical phenomena of pain, tenderness and muscular rigidity can be provoked both from somatic and from visceral structures. The last chapters deal with the pain of visceral disease, its source and the associated reflexes, and the final chapter with the principles underlying the application of experimental methods to patients suffering from spontaneous pains. As can be seen, no attempt is made to discuss systematically all the various pains of human disease, for the object of the volume is rather to stimulate interest and inquiry. In this the author succeeds admirably, but the volume offers by no means "easy" reading. Lewis freely admits that the pains of human ills are still mysterious. Any one studying his experiments and the well selected instances cited as examples will acquire a much clearer understanding of the many factors involved in investigating and evaluating pain, the most outstanding symptom which human flesh is heir to. Twenty-six diagrams serve to illustrate the book, and among the bibliography of two hundred and fifty-three pertinent articles no less than twenty-four are those of the author and his coworkers.

METHODS OF TREATMENT IN POSTENCEPHALITIC PARKINSONISM. By *Henry D. von Witzleben*, Elgin State Hospital, Elgin, Illinois. Preface by *Theodore J. C. von Storch*, Associate Professor of Neurology, Albany Medical College; Attending Neurologist, Albany Hospital, Albany, N. Y. Cloth. Nine Tables. Price, $2.75. Pp. 164. New York: Grune and Stratton, 1942.

Postencephalitic Parkinsonism is defined by the author as an epidemic encephalitis typified by characteristic signs. He states that so-callel Bulgarian treatment, with which he had extensive experience, will cure 97 per cent of mild cases, 86 per cent of moderate cases, and 37.6 per cent of severe cases. This treatment consists of the administration of a vinous decoction of Atropa belladonna, which contains chiefly the alkaloids hyoscyamine, scopolamine, atropine and belladonine. This is the chief theme of the monograph; in addition there are short chapters on diagnosis, general remarks on treatment and very brief discussions on the discouraging results of chemo-serum-vaccine fever-Roentgen-surgical therapy and of intralumbar methods. The book is well written and its typography is fine, but under present day conditions it seems a pity to waste thirty-five pages as padding between the aforesaid diminutive "chapters." With twenty-three pages given over to a bibliography, chiefly foreign, one quarter of the proper contents consists of blank pages or chapter headings. Von Witzleben's monograph should fill a useful role in establishing a more hopeful aspect about a condition that is not well understood by the great majority of physicians.

THE TREATMENT OF BURNS. By *Henry N. Harkins*, M.S., M.D., Ph.D., F.A.C.S., Associate Surgeon, Henry Ford Hospital, Detroit; Formerly Instructor in Surgery, University of Chicago; John Simon Guggenheim Memorial Fellow in Surgery, 1938-1939. Pp. 457, 120 illustrations. Price, $6.50. Baltimore, Md., Charles C. Thomas, 1942.

Six thousand people die of burns in the United States each year, but the importance of their effec-

tive treatment is based not only on these fatalities but on the disfigurement of the survivors. The author states that the treatment of burns is now in a more or less chaotic state, for the calm assurance of ten years ago that tannic acid had solved the problem for once and all has given way to the uncertainty produced by a multitude of favorite tanning agents—tannic acid-silver nitrate, gentian violet, brilliant green and many others, while cod liver oil and hypertonic saline baths are also increasing in popularity. Basing his opinion on his extensive experience in the observation and treatment of burns at the University of Chicago Clinics and at the Henry Ford Hospital in the United States, as well as at the Royal Hospital for Sick Children, Edinburgh, and in other parts of Europe—as a John Simon Guggenheim Memorial Fellow—the author feels that a decision may be reached soon as to which is the best remedy for burn treatment. There are four main divisions of the book: I. The Burn and Its Effects; II. Treatment; III. Special Burns, and IV. Practical Outline of Burn Treatment. A special feature in the scholarly and comprehensive presentation is a biographic sketch and photograph of four men who have made important contributions to the study of burns: the Frenchman, Baron Dupuytren, who introduced the accurate pathologic study of burns; the American, Frank Pell Underhill, who by experimental studies emphasized the necessity of treating the patient as well as the burn itself; the Britisher, Thoams Blizard Curling, who correlated the association of duodenal ulcer with burns, and the American, Edward Clark Davidson, who discovered the tannic acid treatment. All aspects of the subject and all methods of treatment receive ample consideration. One hundred and twenty excellent photographs and sixteen charts illustrate the volume, and a bibliography of 1320 titles shows the enormous medical interest in the problem of burns. This is a book which should be of special value not only to all physicians treating burns but to all medical men interested in clinical research.

FIRST AID PRIMER. By *Hermann Leslie Wenger*, M.D., New York Post-Graduate Hospital; and *Eleanora Sense*, B.Sc., M.Sc., Food and Nutrition Editor, *American Home Magazine*. Cloth. Pp. 104, with illustrations. Price, $1.00. Second Edition. New York: M. Barrows & Co., Inc., 1942.

The fact that almost every one in our communities is taking or has just completed a course in first aid or is teaching some phase of work associated with the defense effort probably accounts in a measure for the popularity of this primer, which has already reached its second printing. It includes chapters on civilian defense health aids, emergency feeding, black-out instructions and morale through nutrition. The subject matter, while treated briefly, is presented in plain language intended for the lay person. Many simple but exceedingly instructive illustrations aid the reader to obtain a working knowledge of the principles stressed. The authors have prepared this small volume as a suitable part of the first aid kit. The public can prepare itself to care for many casualties and minor injuries and thus relieve the work of the armed forces and aid in making the limited medical service we may be facing reach as far as possible.

INTERNAL MEDICINE IN OLD AGE. By *Albert Mueller-Deham*, M.D., Associate Visiting Physician, Welfare Hospital for Chronic Disease (Second Division), Department of Hospitals, New York City; formerly Clinical Professor of Internal Medicine, University of Vienna Medical School, and Chief of Medical Division, Municipal Hospital for Chronic Disease, Vienna and *S. Milton Rabson*, M.D., Assistant Professor of Pathology, New York Post-Graduate Medical School, Columbia University (on leave); Lieutenant Commander, United States Naval Reserve. Cloth. Eleven Figures. Price, $5.00. Baltimore: The Williams & Wilkins Company, 1942.

The increasing interest in the diseases of the aged has brought forth another volume on "Geriatrics" whose senior author directed fifteen years in a hospital in Vienna for chronic diseases, from where he came recently, while Dr. Rabson brings in his own studies on the pathologic changes of senility. The text is divided into a general introductory section which embraces the status, problems, difficulties and other broad components of geriatric medicine. Primary emphasis is placed on diagnosis with the features and complications unique to the last stages of life; particular attention is devoted to treatment, which is considerably more effective than it is generally assumed. The clinical discussions under the broad headings of respiratory, cardiovascular urogenital, musculo-skeletal systems and metabolic disorders contain a wealth of practical considerations of pathology, differential diagnosis and therapy; these should be of great value to all physicians dealing with patients past middle age, now constituting an ever increasing proportion of our population. The physical therapeutic aspects of the treatment receive a fair amount of consideration, which include that of the newer methods. The essential literature of the subject both foreign and American is ably presented with many pertinent comments and a fairly extensive index enables quick orientation of the material presented. Mueller-Deham and Rabson's volume is as specific and positive as today's knowledge of disease of old age permits and is indeed destined to dispel the remnants of therapeutic nihilism with regards to the senile patient. It can be unhesitatingly recommended as the up-to-date and fully practical contribution on the subject.

PHYSICAL THERAPY ABSTRACTS

Physiotherapy and the Soldier's Foot. E. J. Crisp.

Proc. Roy. Soc. Med. 35:217 (Jan.) 1942.

The author divides the cases into two groups, namely, Group A: feet which gave no trouble prior to joining the Army and Group B: feet which, though more or less normal to look at, were already giving trouble in civil life. The majority of patients coming for treatment will be in Group B.

Discussing the weak foot the author stated that acute fatigue, the direct result of making weak muscles work under a full load, will cause many breakdowns. For example, a recruit who has never marched more than five miles is suddenly sent out for a twenty mile route march. His feet are completely exhausted, but before they have a chance to recover they are called on for further activities the next day. The consequence is that his feet never recover. In a case like this acute foot strain results, the feet will be valgus and exceedingly tender, there will probably be spasm of the intrinsic muscles and there may be some swelling. In addition, the condition of the feet will provide a suitable soil for the fibrositic nodule. The patient will complain of aching and throbbing even when at rest. There is only one thing to do; he is utterly exhausted; put him to bed until all pain, spasm and swelling have gone, the only treatment during this period being heat and massage. Strengthening and corrective exercises are then given for several days, the patient still remaining in bed. After this he is allowed to get up, strictly individual treatment is continued and he is taught to stand and walk correctly. Only when all pain has disappeared and his feet are reasonably strong, is he promoted to the foot class. Later, when he has sufficiently recovered, he is sent for light physical therapy and in due course he progresses to full physical therapy and strengthening walks.

The author has recently devised an improved method of muscle stimulation by which several individual muscles, in this case the tibialis anticus and the intrinsics of the foot, may be made to contract simultaneously and perform a definite action. The machine used is an "Indolor" and each muscle or group of muscles is supplied through a separate potentiometer so that each may receive an equal stimulus. The foot is attached to a footpiece which is hinged at the level of the metatarsophalangeal joints, the toes being tied down separately. The rear of the footpiece rotates on a swivel, the front of the footpiece slides to and fro in a horizontal slot, the result being that dorsiflexion of the foot produces plantar-flexion of the toes.

Two electrodes each are applied to the tibialis anticus and to the intrinsics. On surging the current, contraction of the tibialis anticus produces dorsiflexion of the foot and by the attachment of the foot to the footpiece, plantar-flexion of the toes. Simultaneously, the stimulus to the intrinsics produces full lumbrical action. At the same time electrical stimulation as described strengthens the two muscles which are weak and, in addition, powerfully stretches the long extensor tendons and metatarsophalangeal joints, rendering any manipulation unnecessary.

By these various means this type of foot is re-educated, muscular tone and coordination restored and deformities corrected. Then, and only then, does the recruit start class work and in due course physical therapy. After a stay in the hospital of upwards of six weeks he will be fit to return to his unit, wearing his army boots and in his original category.

In theory, almost 100 per cent of conditions of the types described by the author should recover. These results were only achieved by rigorous observance of the principles of preliminary rest, individual treatment and a sufficiently long stay in hospital.

There is no place in the Army for the soldier with painful feet and the task is to return him to his unit in the shortest possible time with his feet so sound that there is no likelihood of their breaking down again. Strict attention should be given to the following points:

(1) The soldier with painful feet is suffering from a major disability which must be treated as such and he must therefore be admitted to the hospital. Out-patient treatment is unsatisfactory.

(2) In most cases preliminary rest in bed will be essential.

(3) Individual treatment is absolutely necessary until all mechanical errors are corrected.

(4) Sufficient time must be allowed in the hospital for the soldier's feet to recover. This will take four to eight weeks. Allowing insufficient time will only result in failure.

(5) Full and intelligent cooperation from the patient is required.

(6) When up and about, Army boots should be worn whenever possible. "Slopping about" in plimsolls is harmful.

(7) The regimental M.O. should never regard a painful foot as a trivial complaint. He must realize that the sooner a patient receives treatment, the greater the prospect of a satisfactory result.

Regeneration in the Ulnar, Median and Radial Nerves. Henry C. Marble; Edward Hamlin, Jr., and Arthur L. Watkins.

Am. J. Surg. **55**:274 (Feb.) 1942.

This report summarizes the results in 110 injured ulnar, median and radial nerves, treated at the Massachusetts General Hospital during the years 1931 to 1940. Eighty-four and five-tenths per cent were considered to have shown satisfactory end results based on arbitrary criteria. Ulnar nerves successfully regenerated in 88 per cent, median in 82 per cent and radial in 78 per cent of their total numbers.

It could not be established that the age of the patient, the presence of infection in wounds or the time interval between injury and treatment had any bearing materially upon the eventual outcome. The average rate of regeneration lay between 1 and 1.5 mm. a day.

Nerve injuries associated with fractures are discussed separately and are shown to regenerate successfully in 95.7 per cent of their total number.

A new technic of determining electrical excitability in peripheral nerves is described and methods of treatment are outlined.

Rational Use of Physical Medicine. C. F. Voyles.

J. Indiana M. A. **35**:148 (March) 1942.

The physical equipment used by the author is as follows: short and ultra-short wave machine; high frequency machine for conventional (old type) diathermy and other uses; water-cooled ultraviolet; air-cooled ultraviolet; a sinusoidal apparatus containing a unit for galvanism, and an infra-red lamp for convenient and quick heating. The equipment for a hospital or a sanitarium would necessarily be more elaborate.

The short and ultra-short wave are used for diathermy in conditions too numerous to enumerate here. If the cases are properly selected, improvement may reasonably be expected. There is evidently no great difference between the effects of the short and ultra-short wave nor between the effects of short wave diathermy and conventional (old type) diathermy. However, the short wave machine is so much more convenient and time-saving that it has largely superseded conventional diathermy. The short wave has the additional advantage of being less likely to cause a burn. There is always some danger of a burn in using conventional diathermy, unless the technician is ever alert.

Absorption of Light by Skin. Queries and Minor Notes.

J. A. M. A. **117**:817 (Aug. 30) 1941.

To the Editor: — The pigment cells of the skin absorb light. What happens to the energy which is bound to develop after this absorption? Is there any proof that this energy acts within the skin, for instance, liberating the loosely bound histamine? Could you refer me to literature on the subject of light and pigmentation? M.D., Missouri.

Answer. — Probably most of the energy transformed from the light being absorbed by pigment as well as other structures in the skin, and by the fluids such as the lymph and blood, is transformed into heat. Portions of this energy may be utilized for developing light of new wavelengths — fluorescence. Still other portions of this energy are utilized for chemical reactions; it is known that ultraviolet radiation may act as an oxidizing agent. It is probable that histamine is liberated in varying amounts. Some people develop urticaria on exposure to sunlight and others an erythema or severe dermatitis on exposure to light, which probably takes place with the release of histamine or histamine-like bodies. — (Reprinted with permission.)

Treatment of Impetigo Contagiosa. Milton T. Ebner.

Ohio State M. J. **38**:35 (Jan.) 1942.

The disease is caused by a mixture of Staphylococci and Streptococci. Successful treatment depends on the complete removal of the dry crusts that form and the thorough application of suitable medication to the oozing, erythematous base, lying directly beneath the crusts. These measures should be outlined in detail to the patient. Strict cleanliness is to be observed by the patient at all times. The unaffected portions of the skin, adjacent to the involved areas, should be washed several times daily with Castile soap and warm water, rinsed and dried. Following this, 3 to 5 per cent U. S. P. ammoniated mercury ointment should be lightly massaged into the non-infected parts. This procedure is always performed before any attempt is made to remove the crusts. Once this prophylactic measure has been accomplished, then, and only then may one direct his attention to the treatment of the affected areas. Pledgets of cotton, soaked with warm mineral oil, or boric acid solution, are then applied to soften the crusts.

When the crusts are sufficiently softened they may be easily lifted from the skin by the use of forceps.

PRELIMINARY PROGRAM

INTENSIVE INSTRUCTION SEMINAR

American Congress of Physical Therapy

21ST ANNUAL SESSION

SEPTEMBER 9, 10, 11, 12, 1942

HOTEL WILLIAM PENN PITTSBURGH, PA.

SCHEDULE OF INSTRUCTION COURSE

WEDNESDAY, SEPTEMBER 9

8:00 to 9:00—(1) *Short Wave Diathermy.* WATKINS. Parlor B.

8:00 to 9:00—(2) *Administration of Hospital Physical Therapy Department.* MOLANDER. Parlor C.

8:00 to 9:00—(3) *Use of Physical Therapy in Internal Medicine.* HUDDLESTON. Parlor D.

9:00 to 10:30—(4) *Fundamentals of Electricity as Applied in Medicine.* JENNY. Parlor B.

9:00 to 10:30—(5) *Foot Disorders.* WEISS. Parlor C.

9:00 to 10:30—(6) *Low Back Pain.* BAKER. Parlor D.

1:00 to 2:00—(7) *Low Voltage Currents.* POLMER. Parlor B.

1:00 to 2:00—(8) *Physical Therapy in Dermatology.* LESTER HOLLANDER. Parlor C.

1:00 to 2:00—(9) *Massage.* BENNETT. Parlor D.

THURSDAY, SEPTEMBER 10

8:00 to 9:00—(10) *Underwater Exercises.* TROEDSSON. Parlor B.

8:00 to 9:00—(11) *Electrosurgery.* SCHMIDT. Parlor C.

8:00 to 9:00—(12) *Infra-Red Radiation.* KOVÁCS. Parlor D.

9:00 to 10:30—(13) *Round Table Discussion, Physical Therapy in War.* COULTER, leader. Parlors B and C.

1:00 to 2:00—(14) *Short Wave Diathermy.* BIERMAN. Parlor B.

1:00 to 2:00—(15) *Physical Therapy in Fractures.* KENDRICK. Parlor C.

1:00 to 2:00—(16) *Colonic Therapy.* MARTUCCI. Parlor D.

FRIDAY, SEPTEMBER 11

8:00 to 9:00—(17) *Physical Therapy in General Practice.* PAUL. Parlor B.

8:00 to 9:00—(18) *Physical Therapy in Otolaryngology.* WAHRER. Parlor C.

8:00 to 9:00—(19) *Physical Therapy in Arthritis.* MARGOLIS. Parlor D.

9:00 to 10:30—(20) *Body Mechanics.* HANSSON. Parlor B.

9:00 to 10:30—(21) *Peripheral Vascular Disease.* HILDENBRAND. Parlor C.

9:00 to 10:30—(22) *Poliomyelitis.* KNAPP. Parlor D.

1:00 to 2:00—(23) *Ultraviolet.* McLOUGHLIN. Parlor B.

1:00 to 2:00—(24) *Physical Therapy in Gynecology.* McGUINNESS. Parlor C.

1:00 to 2:00—(25) *Fever Therapy.* PHILLIPS.* Parlor D.

* In Active Service.

LECTURERS FOR INSTRUCTION COURSE

FRANCES BAKER, M.D., Instructor in Physical Therapy and Orthopedic Surgery, University of California Medical School; Director, Physical Therapy Department, University of California Hospital, San Francisco;

ROBERT L. BENNETT, M.D., Director of Post-Graduate School of Physical Therapy, Georgia Warm Springs Foundation, Warm Springs, Ga.;

WILLIAM BIERMAN, M.D., Assistant Professor in Therapeutics, The New York University College of Medicine; Co-Director, Course for Physical Therapy Technicians, New York University; Attending in Physical Therapy, The Mount Sinai Hospital, New York, N. Y.;

JOHN S. COULTER, M.D., Associate Professor, Physical Therapy, Northwestern University Medical School; Chairman, Council on Physical Therapy, American Medical Association; Regional Medical Officer, Sixth Civilian Defense Region, Chicago;

K. G. HANSSON, M.D., Assistant Professor, Orthopedics, Medical College, Cornell University, New York;

EMIL J. C. HILDENBRAND, M.D., Instructor in Surgery, Georgetown University; Director, Physical Therapy Department, Garfield Hospital, Washington, D. C.;

LESTER HOLLANDER, M.D., Medical Director of Pittsburgh Skin and Cancer Foundation; Chief Department Dermatology and Syphilology, Pittsburgh City Hospital, Montefiore Hospital, Pittsburgh, Pa.;

ORA L. HUDDLESTON, M.D., Assistant Professor, Physiology, University of Colorado School of Medicine; Director, Physical Therapy Department, Colorado General Hospital, Denver, Colo.;

PAUL L. JENNY, M.D., Instructor in Physical Therapy, University of Pittsburgh, School of Medicine, Pittsburgh;

J. I. KENDRICK, M.D., Orthopedist, Cleveland Clinic, Cleveland;

MILAND E. KNAPP, M.D., Clinical Assistant Professor, Radiology and Physical Therapy, University of Minnesota; Director, Physical Therapy Department, Minneapolis General Hospital, University Hospital, etc., Minneapolis;

RICHARD KOVACS, M.D., Professor of Physical Therapy, New York Polyclinic Medical School and Hospital; Attending Physical Therapeutist, Manhattan State Hospital and Department of Correction Hospitals, etc., New York, N. Y.;

HARRY M. MARGOLIS, M.D., Chief in Medicine, St. Margaret Memorial and Montefiore Hospitals, Pittsburgh;

ALBERT A. MARTUCCI, M.D., Instructor, Physical Therapy, Womans Medical College, Philadelphia; Director, Physical Therapy Department, Abington Memorial Hospital, etc., Philadelphia;

CAPT. CHRISTOPHER J. McLOUGHLIN (MC), United States Army, Director, Section on Physical Therapy, Lawson General Hospital, Atlanta, Ga.;

MADGE C. L. McGUINNESS, M.D., Director, Physical Therapy Department, Lenox Hill and Misericordia Hospitals, New York, N. Y.;

CHARLES O. MOLANDER, B.S., M.D., Associate, Physical Therapy, Northwestern University Medical School; Director, Physical Therapy, Michael Reese Hospital, Chicago;

WILLIAM D. PAUL, M.D., Assistant Professor, Internal Medicine, Iowa State University School of Medicine; Director, Physical Therapy Department, University Hospitals, Iowa City;

KENNETH PHILLIPS,* M.D., Chief, Department of Physical Medicine, James M. Jackson Memorial Hospital; Medical Director, Miami Physical Therapy Centre, Miami, Fla.;

NATHAN H. POLMER, M. D., Professor, Physical Therapy, Graduate School of Medicine, Louisiana State University Medical Center, New Orleans;

WILLIAM H. SCHMIDT, M.D., Associate Professor, Physical Therapy, Jefferson Medical College, Philadelphia;

B. S. TROEDSSON, M.D., Director, Physical Therapy Department, Orange Memorial Hospital; Assistant Director, Physical Therapy, New York Hospitals, etc., Orange, N. J.;

FREDERICK LOUIS WAHRER, M.D., Chief of Staff, Deaconess Evangelical Hospital; Consulting Otolaryngologist, Iowa State Training School for Boys, etc., Marshalltown, Iowa;

ARTHUR L. WATKINS, M.D., Assistant, Medicine, Harvard University Medical School; Medical Director, Course for Physical Therapy Technicians, Bouve-Boston, Tufts University; Director, Physical Therapy Department, Massachusetts General Hospital, Boston;

JEROME WEISS, M.D., Attending Physical Therapy, Hospital for Joint Diseases, etc., New York, N. Y.

* In Active Service.

IMPORTANT INFORMATION

The instruction course will be given from 8 to 10:30 A.M., and from 1 to 2 P.M. on the days of Wednesday, Thursday and Friday during the convention week, enabling attedance at both the course and scientific session during the same period.

Each registrant is allowed the choice of one lecture during a period, there being three instruction periods every day. Nine lectures may be selected from the twenty-five listed. The charge for the schedule of nine lectures is $15.00. The right is reserved to reject any application if the Course Committee finds it desirable to do so. Registration for specific courses cannot be guaranteed when quotas are filled.

For Information Address Executive Director, American Congress of Physical Therapy, 30 N. Michigan Ave., Chicago, Ill.

APPLICATION FOR INSTRUCTION COURSE

In Conjunction with the

21st Annual Scientific and Clinical Session

of the

AMERICAN CONGRESS OF PHYSICAL THERAPY

September 9, 10, 11, 1942

Hotel William Penn, Pittsburgh, Pa.

Name.....
(Print)

Address.....

Are you a member of the A. M. A.?.....Are you a member of your county medical society?.....

Give name .....

Are you a member of the American Registry of Physical Therapy Technicians?.....If you are not a registered technician, please give the name and address of a physician who will sponsor you.....

.....

After reading schedule of courses offered, make up the schedule you wish to take, listing courses by number:

Date.....

.....
Signature in ink

Please do not mail check until you are informed that your application has been accepted. Mail to:

American Congress of Physical Therapy
30 North Michigan Avenue Chicago, Illinois

SPECIAL EVENTS

WEDNESDAY, September 9

8:30 A. M.

Executives' Breakfast
(By invitation)
Forum Room — 17th floor.

12 Noon

Motion Picture
Prevention and Immediate Care of Athletic Injuries.
Parlor F

12:30 Noon

Luncheon Meeting for Members
Society of Physical Therapy Physicians.
Forum Room — 17th floor.

7 P. M.

Annual Business Session.
Urban Room

THURSDAY, September 10

8:30 A. M.

Editorial Board Breakfast
(By invitation)
Forum Room — 17th floor.

12 Noon

Motion Picture
The Stimulation of Capillary Circulation With Mecholyl Chloride by the Method of Ion Transfer (Iontophoresis)
Parlor F

7 P. M.

Annual Banquet — Informal.
Urban Room

FRIDAY, September 11

8:30 A. M.

Registry Boards Breakfast.
(By invitation)
Forum Room — 17th floor.

12 Noon

Motion Picture
The Base of Cabinet Fever Therapy in Choreic Children (Dr. Robert Dow).
Parlor F

SATURDAY, September 12

1 P. M.

Visit to D. T. Watson School of Physical Therapy.
Assemble at Hotel William Penn for visit to the beautiful D. T. Watson School for Physical Therapy Technicians at Leetsdale, Pa. Those who wish to make late afternoon and evening trains can plan to make this trip. Transportation to and from Leetsdale will be provided. Be sure to plan for this special treat.

8:30 A. M.

See Special Events, Page 440

GENERAL SCIENTIFIC SESSION

WEDNESDAY, September 9, 11 A. M.

URBAN ROOM

OFFICERS OF THE SECTION

Chairman — H. WORLEY KENDELL, Dayton, Ohio.
Secretary — NATHAN H. POLMER, New Orleans.

Present Status of Electromuscle Stimulation.

STAFFORD L. OSBORNE, Ph.D., Assistant Professor, Physical Therapy, Northwestern University Medical School, Chicago;
and
FRED SHERMAN GRODINS, M.D., Research Assistant in Physiology, Northwestern University Medical School, Chicago.

The Various Syndromes Due to the Mandibular Posture and Their Correction.

VICTOR STOLL, D.D.S., Clinician and Lecturer, New York, N. Y.

Hydrotherapy.

Major EUCLID SMITH, Medical Corps, United States Army, Ellington Field, Texas.

12 Noon

See Special Events, Page 440

GENERAL SCIENTIFIC SESSION

WEDNESDAY, September 9, 2:30 P. M.

URBAN ROOM

OFFICERS OF THE SECTION

Chairman — WILLIAM BIERMAN, New York, N. Y.
Secretary — EARL C. ELKINS, Rochester, Minn.

The Clinical Uses of Oxygen.

WALTER MEREDITH BOOTHBY, M.D., Professor of Experimental Metabolism, The Mayo Foundation, Graduate School, University of Minnesota, Rochester, Minn.

Resuscitation.

FRANK S. ROSSITER, M.D., Lecturer in Industrial Hygiene, University of Pittsburgh, School of Medicine.

Discussion of foregoing papers: A. J. Kotkis, M.D., St. Louis, Mo.; G. J. Thomas, M.D., Pittsburgh.

Use of Diathermy in Pelvic Inflammatory Disease.

HAROLD F. ZIPRICK, M.D., Instructor in Obstetrics and Gynecology, College of Medical Evangelists, Los Angeles;
JASPER WAYNE McFARLAND, M.D., Instructor in Physical Therapy, College of Medical Evangelists, Los Angeles;
CLARENCE W. DAIL, M.D., Assistant Professor, Pharmacology and Therapeutics, College of Medical Evangelists, Los Angeles;
and
FRED B. MOOR, M.D., Professor of Pharmacology and Therapeutics, College of Medical Evangelists, Los Angeles.

Discussion: W. E. Lawson, M.D., Homestead, Pa.; Paul Rike, M.D., Pittsburgh; B. Billman, M.D., Cincinnati, Ohio.

The Problem in Cerebral Palsy.

WILLIAM COOPER, M.D.,* Attending Orthopedic Surgeon to Out Patient Department, in Charge of Cerebral Palsy, Hospital for Special Surgery, New York, N. Y.

Discussion: K. G. Hansson, M.D., New York, N. Y.; I. F. Hummon, M.D., Chicago; Pryce Jenkins, Ph.D., Pittsburgh.

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* In Active Service.

The Influence of Internal Fixation on Early Motion of Fractured Limbs.

GEORGE VANCE FOSTER, M.D., Associate Chief Surgeon, Carnegie-Illinois Steel Company, Pittsburgh.

Discussion: H. J. Jordan, M.D., New York, N. Y.; Francis Glenn, M.D., Miami, Fla.; James A. Dickson, M.D., Cleveland.

DEMONSTRATION

WEDNESDAY, September 9, 5 P. M.

URBAN ROOM

Massage — Diagnostic and Therapeutic.

HAROLD D. STORMS, B.A., M.D., Medical Director, Physiotherapy and Occupational Therapy Clinic, The Workmen's Compensation Board of Ontario, Toronto, Canada.

7 P. M.

See Special Events, Page 440

EVENING SESSION

WEDNESDAY, September 9, 9 P. M.

URBAN ROOM

JOINT MEETING

American Congress of Physical Therapy

Pittsburgh Society of Roentgenologists

OFFICERS OF THE SECTION

Chairman — A. R. Hollender, Chicago.
Secretary — Richard Kovacs, New York, N. Y.

FORMAL OPENING OF THE 21st ANNUAL SESSION

INVOCATION

The Rev. John Ray Ewer, D.D.,
Pastor, East End Christian Church, Pittsburgh

ADDRESS OF WELCOME

Cornelius D. Scully
Mayor, City of Pittsburgh

Samuel R. Haythorn, M.D.
President, Allegheny County Medical Society

I. Hope Alexander, M.D.
Director, Department of Public Health

Moses Baker, M.D.
President, Pittsburgh Academy of Medicine

W. S. McElroy, M.D.
Dean, University of Pittsburgh, School of Medicine

Leslie H. Osmond, M.D.
President, Pittsburgh Society of Roentgenologists

INDUCTION OF PRESIDENT-ELECT

ADDRESS

The Future of Physical Medicine

Fred Bennett Moor, M.D., Los Angeles.

Physical Therapy in Certain Medical Conditions.

GEORGE MORRIS PIERSOL, M.D., Professor of Medicine, Graduate School of Medicine, University of Pennsylvania; Member, Council on Physical Therapy, American Medical Association, Chicago.

Painful Back.

PAUL B. MAGNUSON, M.D., Professor of Surgery; Chief, Bone and Joint Department, Northwestern University Medical School, Chicago.

8:30 A. M.

See Special Events, Page 440

GENERAL SCIENTIFIC SESSION

THURSDAY, September 10, 11 A. M.

URBAN ROOM

OFFICERS OF THE SECTION

Chairman — Walter S. McClellan, Saratoga Springs, N. Y.
Secretary — Frances Baker, San Francisco.

Electric Shock Therapy in Major Psychoses.

RALPH S. BANAY, M.D., Director of the Psychiatric Clinic, Sing Sing Prison, New York, N. Y.

Physical Basis of Short Wave Diathermy.

H. J. HOLMQUEST, B.S., B.S. (M.E.), Lecturer, Applied Physics, Northwestern University Medical School, Chicago.

Problems in the Management of the Physical Therapy Patient.

MILTON G. SCHMITT, M.D., Clinical Assistant, Department of Physical Therapy, Northwestern University Medical School, Chicago.

12 Noon

See Special Events, Page 440

GENERAL SCIENTIFIC SESSION

THURSDAY, September 10, 2:30 P. M.

URBAN ROOM

OFFICERS OF THE SECTION

Chairman — Fred B. Moor, Los Angeles.
Secretary — John J. McGuire, Pensacola, Fla.

A Postoperative Study of the Arterial Tree in the Foot and Leg.

J. WEST MITCHELL, M.D., Assistant Professor of Medicine, University of Pittsburgh, School of Medicine, Pittsburgh.

Discussion: Karl Harpuder, M.D., New York, N. Y.; J. Ross Veal, M.D., Washington, D. C.; I. Levin, M.D., Washington, D. C.

Symposium on Poliomyelitis

Treatment of Poliomyelitis in the Acute Stage.

JOHN A. TOOMEY, M.D., Professor, Clinical Pediatrics and Contagious Diseases, Western Reserve University, School of Medicine, Cleveland.

Basis of Transitions of Physical Treatment of Poliomyelitis.

JESSIE WRIGHT, M.D., Director, D. T. Watson School of Physical Therapy, Leetsdale; Pittsburgh.

The Kenny Method for the Treatment of Poliomyelitis.

MILAND E. KNAPP, M.D., Clinical Assistant Professor, Radiology and Physical Therapy, University of Minnesota, Minneapolis.

Discussion: Robert L. Bennett, M.D., Warm Springs, Ga.; B. S. Troedsson, M.D., New York, N. Y.; Clarence H. Heyman, M.D., Cleveland.

DEMONSTRATION

THURSDAY, September 10, 5 P. M.

URBAN ROOM

Therapeutic Exercise.

HANS J. BEHREND, M.D., Lecturer, Physical Therapy, School of Education, New York University; Associate, Physical Therapy, Hospital for Joint Diseases, New York, N. Y.

8:30 A. M.

See Special Events, Page 440

GENERAL SCIENTIFIC SESSION

FRIDAY, September 11, 11 A. M.

OFFICERS OF THE SECTION

Chairman — FREDERICK L. WÄHRER, Marshalltown, Iowa.
Secretary — ALBERT A. MARTUCCI, Philadelphia.

Recent Studies on the Physiology of Speech Production.

O. LEONARD HUDDLESTON, M.D., Assistant Professor of Physiology and Pharmacology, University of Colorado School of Medicine; Director, Department of Physical Therapy, Colorado General Hospital, Denver;
and
MISS ADALINE BULLEN, Instructor of Speech Science, Speech Pathology, Director, Speech Clinic for Normals, University of Denver, Denver.

Physical Therapeutic Procedures in Otolaryngology: A Resumé of Twenty Years Experience.

A. R. HOLLENDER, M.D., Assistant Professor, Laryngology, Rhinology and Otology, University of Illinois College of Medicine, Chicago.

The Galvanic Bath.

HARRY TEVEL ZANKEL, M.D., Instructor, Physical Therapy, New York Polyclinic Medical School and Hospital; Director, Department of Physical Therapy, Beth Moses Hospital, Brooklyn, N. Y.

12 Noon

See Special Events, Page 440

GENERAL SCIENTIFIC SESSION

FRIDAY, September 11, 2:30 P. M.

URBAN ROOM

OFFICERS OF THE SECTION

Chairman — KENNETH PHILLIPS,* Miami, Fla.
Secretary — JOHN S. HIBBEN, Pasadena, Calif.

Symposium on Fever Therapy

Physical Therapy in Brucellosis.

EARL C. ELKINS, M.D., Consultant in Physical Medicine, Mayo Clinic, Rochester, Minn.

Report of Progress in the Application of Artificial Fever in the Treatment of Syphilis and Gonococcic Infections.

H. WORLEY KENDELL, M.D., Director, Department of Physical Medicine, Miami Valley Hospital; Director, Kettering Institute for Medical Research, Dayton.

The Treatment of Rheumatic Chorea and Complicating Endocarditis by Artificial Fever Therapy.

ROBERT F. DOW, M.D., Director of the Fever Therapy and Physical Therapy Department, St. Joseph's Hospital, Paterson, N. J.

Discussion of foregoing papers: D. S. Cowles, M.D., Ostrander, O.; Samuel Sherman, M.D., Homestead, Pa.

Manipulative Surgery.

JOHN W. FREDETTE, M.D., Assistant Professor of Surgery, University of Pittsburgh School of Medicine, Pittsburgh.

Discussion: Frances Baker, M.D., San Francisco; Troy Bagwell, M.D., Knoxville, Tenn.; Wilton Robinson, M.D., Pittsburgh, Pa.

* In Active Service.

Refrigeration Anesthesia for Extremity Surgery.

FREDERICK M. ALLEN, M.D., Professor, Department of Internal Medicine, New York Polyclinic Medical School and Hospital, New York, N. Y.,
and
LYMAN WEEKS CROSSMAN, M.D., Senior Attending Surgeon, New York City Hospital, New York, N. Y.

Discussion: John W. Shirer, M.D., Pittsburgh; M. K. Newman, M.D., Detroit, Mich.

DEMONSTRATION

FRIDAY, September 11, 5 P. M.

URBAN ROOM

Low Back Pain.

FRANK H. EWERHARDT, M.D., Professor, Physical Therapeutics, Washington University School of Medicine; Director, Barnes Hospital, Washington University, School for Physical Therapy, St. Louis.

GENERAL SCIENTIFIC SESSION

FRIDAY, September 11, 8 P. M.

URBAN ROOM

OFFICERS OF THE SECTION

Chairman — K. G. HANSSON, New York, N. Y.
Secretary — ROY W. FOUTS, Omaha, Neb.

The Importance of Physical Therapy in the Hospitals in México.

NICANDRO CHÁVEZ, M.D., Professor, Physical Therapy National University of México, México, D. F.

Refinements in the Treatment of Arthritics Including Physical Therapy.

RALPH PEMBERTON, M.D., Professor of Medicine, Graduate School of Medicine, University of Pennsylvania; President, Ligue Internationale contre le Rhumatisme, Philadelphia.

Physical Therapy in Civilian Defense.

JOHN S. COULTER, M.D., Chairman, Council on Physical Therapy, American Medical Association; Regional Medical Officer, Sixth Civilian Defense Region, Chicago.

Physical Therapy in Relation to Military Medicine.

Capt. CHRISTOPHER J. McLOUGHLIN, Medical Corps, United States Army, Lawson General Hospital, Atlanta, Ga.

GENERAL SCIENTIFIC SESSION

SATURDAY, September 12, 9 A. M.

OFFICERS OF THE SECTION

Chairman — MILAND E. KNAPP, Minneapolis.
Secretary — DISRAELI KOBAK, Chicago.

Sustained (or Prolonged) Radiant Heat Therapy in Lesions of the Pelvis.

Lieut. Comm. BENGT NORMAN BENGTSON, Medical Corps, United States Navy, Great Lakes Naval Training Station, Great Lakes, Ill.

Discussion: Madge C. L. McGuinness, New York, N. Y.; Louis B. Newman, M.D., Chicago; George Lyford, M.D., Cincinnati, O.

Treatment of Backache. A New Approach.

A. W. SCHENKER, M.D., Instructor in Physical Therapy, Columbia University Postgraduate Medical School, New York, N. Y.

and

WILLIAM BIERMAN, M.D., Assistant Clinical Professor, Therapeutics, New York University College of Medicine; Attending, Physical Therapy, Mount Sinai Hospital, New York, N. Y.

Discussion: David Jones, M.D., Louisville, Ky.; C. O. Molander, M.D., Chicago.

Functions of Leg Stumps and Prostheses.

PAUL B. STEELE, M.D., Professor, Orthopedic Surgery, University of Pittsburgh, School of Medicine, Pittsburgh.

Discussion: Howard A. Carter, B.S., in M.E., Chicago; W. J. McGregor, M.D., Wilkinsburg, Pa.

Dermatology and Physical Therapy in the Navy.

Lieut. R. R. M. McLAUGHLIN, Medical Corps, United States Naval Reserve, Norfolk Naval Hospital, Portsmouth, Va.

Discussion: Joseph Shelton, M.D., Washington, Pa.; Earl W. Netherton, M.D., Cleveland, O.

Ultraviolet Irradiation of Auto Transfused Blood in the Treatment of E. Coli Septicemia.

ELMER WILLIAM REBBECK, M.D., Senior Active Staff Surgeon, Shadyside Hospital, Pittsburgh.

Discussion: Disraeli Kobak, M.D., Chicago; G. J. P. Barger, M.D., Washington, D. C.

1 P. M.

See Special Events, Page 440

SCIENTIFIC EXHIBITS

AMERICAN MEDICAL ASSOCIATION, COUNCIL ON PHYSICAL THERAPY.

An exhibit consisting of manikins, charts and cut-away models describing the most effective methods of making a satisfactory prosthesis for legs, arms and fingers, with especial emphasis on physical therapy for the stump and the training of a person in the use of artificial limbs.

AMERICAN OCCUPATIONAL THERAPY ASSOCIATION.

The traveling exhibit of the association will be shown.

AMERICAN PHYSIOTHERAPY ASSOCIATION.

Posters: (1) Publications of the American Physiotherapy Association; (2) Membership qualifications and scope of the Association; (3) "The Nation Needs Physical Therapists."

AMERICAN REGISTRY OF PHYSICAL THERAPY TECHNICIANS.

Data to show progress of the Registry.

DR. K. G. HANSSON and MISS FLORENCE LILJANDER, B.S., Hospital for Special Surgery, New York, N. Y.

DR. KARL HARPUDER, and DR. IRWIN D. STEIN, Montefiore Hospital, Bronx, New York, N. Y.

Exhibit I. Microphotographs of capillaries in normal extremities and in peripheral vascular disease, with distinguishing characteristics of each pattern. Also, the effect of various physical modalities on these. Exhibit II. Case reports, explanatory remarks, diagrams and pictures illustrating a little known clinical entity — thrombophlebitis in the foot.

Exercises for low back strain.

DR. O. LEONARD HUDDLESTON, University of Colorado School of Medicine, Department of Physical Therapy, Department of Physiology and Pharmacology, and ADALINE S. BULLEN, M.A., University of Denver, Department of Voice Science and Speech Correction.

Principles of Speech Analysis.

DR. JOSEPH KOVACS, New York.

Diagnosis and Treatment of Leg Ulcers: Exhibit of pictures and charts differentiating ulcers following arteriosclerosis, diabetes, varicose veins, syphilis and idiopathic causes; medical and surgical treatment of various types of ulcers are described.

DR. RICHARD KOVACS, Professor and Director, Physical Therapy New York Polyclinic Medical School and Hospital, New York, N. Y.

Photographs, drawings and charts showing the development of electrotherapy from the early days to the present time.

OFFICE OF CIVILIAN DEFENSE, MEDICAL DIVISION, WASHINGTON, D. C., Dr. George Baehr.

Emergency Medical Service for Civilian Defense.

DR. MILTON G. SCHMITT, Northwestern University Medical School, Chicago.

Educational Exhibit on Short Wave Diathermy. Technical and Clinical Considerations. I. What it is. II. How it is applied. III. What its effects are. IV. What it is used for.

DR. DAVID SILVER, Professor Emeritus of Orthopedic Surgery, University of Pittsburgh School of Medicine, Pittsburgh, Pa.

Braces and appliances to facilitate correction and function.

DR. VICTOR STOLL, D.D.S., Madison Park Hospital (Brooklyn) New York, N. Y.

The correct posture of the mandible in relation to the maxilla, an important factor in general body mechanics. How faulty posture of the mandible brings about patho-physiomechanics responsible for many syndromes about the mouth, throat, head and neck. The means for diagnosis and correction of mandibular posture.

DR. ARTHUR L. WATKINS, Department Physical Therapy; DR. ROBERT S. SCHWAB, Electromyographic Laboratory and DR. MARY A. B. BRAZIER, Massachusetts General Hospital, Boston.

Charts showing studies of electrical excitability, electromyograms, ergograms and limb volume measurements in patients with peripheral nerve injuries, poliomyelitis. Effects of physical therapeutic agents as indicated by these measurements.

These studies were aided by a grant from the National Foundation for Infantile Paralysis.

THE VETERANS' ADMINISTRATION, Washington, D. C.

A summary of three years of experience with some of the standard apparatus used in the treatment of peripheral vascular disease at the Veterans' Administration Facility, Pittsburgh, Pennsylvania.

TECHNICAL EXHIBITS

AMERICAN HOSPITAL SUPPLY CORPORATION.

The Sander's Vasoscillator is recognized among leaders, who specialize in the conservative treatment of peripheral vascular and cardiovascular diseases. Be sure to see the latest design apparatus, which utilizes gravity to aid the circulation without physical effort on the part of the patient. American also will display the Dickson Paraffin Bath, a thermostatically controlled unit, which gives the maximum advantages of paraffin treatment. Other interesting American Hospital Supply specialties will be on exhibit.

ARCHIVES OF PHYSICAL THERAPY.

The leading physical therapy publication, issued monthly, under the auspices of the American Congress of Physical Therapy. Contains most of the scientific papers and addresses presented at the annual session. Other features consist of its abstract section, book reviews, and physical therapy news. Subscriptions will be taken at this booth.

THE BURDICK CORPORATION.

The Burdick Corporation will exhibit their complete line of physical therapy equipment. This includes short wave diathermy, ultraviolet and infra-red lamps, as well as the Rhythmic Constrictor for the treatment of peripheral vascular conditions.

CAMERON SURGICAL SPECIALTY COMPANY.

See the Cameron Flexible Gastroscopes, Bronchoscopes, Esophagoscopes, Laryngoscopes, Binocular Prism Loupe, Color Flash Clinical Camera, Mirrolite and other developments in electrically lighted Diagnostic and Operating Instruments for all parts of the body. As all instruments work from dry cells as well as electric light current, in the event of a "black out" or emergency failure of electric light current, the surgical work can proceed. Of special interest are the new Electro-Surgical Units (the genuine Radio Knives) for cutting, coagulating, desiccating and fulgurating in all sizes from the office model Cauteradio to major Hospital Units with abundance of power for radical surgery.

CONFORMAL PERSONALIZED SHOES.

You are cordially invited to enjoy a complimentary trial fitting in this revolutionary new footwear advancement, perfected by the world's largest shoe manufacturer. CONFORMALS are actually moulded to fit and support your individual arches by a remarkable plastic fitting process which automatically provides individually-balanced support by means of hydraulic action within the CONFORMAL Plastic Arch. These shoes are made in a wide variety of smart styles for men and women and you may purchase a pair at a special professional discount while at the convention.

E & J MANUFACTURING COMPANY.

Members and visitors are cordially invited to see an interesting demonstration of mechanical resuscitation as exemplified by the E & J Automatic Resuscitator. The respiratory rate and volume of respiration of the apparatus are controlled by the lungs of the non-breathing patient. Resuscitation, both by mask and catheter, will be demonstrated.

H. G. FISCHER & COMPANY.

The best way to look at an x-ray apparatus is with an x-ray. You have to get under the finish. It's down there that the real difference lies. To every visitor at the A. C. P. T. Session, accordingly, we give this special invitation: Look under the finish of the new FISCHER models of apparatus shown! FISCHER shockproof x-ray apparatus, short wave units, ultraviolet and other generators are built both for performance and to stand the very hardest day by day usage. Demand to be shown the real under-the-finish facts about FISCHER Models.

GENERAL ELECTRIC X-RAY CORPORATION.

With every indication that the science of physical medicine is entering a period when it will be evaluated anew and appreciated as never before, General Electric X-Ray Corporation's exhibit at this meeting will be significant of important trends in apparatus design, in keeping with progress in this branch of therapeutics.

HANOVIA CHEMICAL & MFG. COMPANY.

Hanovia will exhibit a complete line of the new self-lighting type ultraviolet quartz lamps — Sollux Radiant Heat Lamps — Short and Ultra-Short Wave Diathermy apparatus. Don't fail to witness a demonstration of the new Aero-Kromayer which is cooled by air and is rapidly replacing the old Water-Cooled type. Courteous and competent representatives will be pleased to be of any service.

THE ILLE ELECTRIC CORPORATION.

The Ille Electric Corporation will demonstrate the latest models Underwater Therapy Tanks with Hydro-Massage for the treatment of Infantile Paralysis, Arthritis, and other disabling conditions, a folding Thermostatically Controlled Bed Tent and Paraffin Bath.

LEA & FEBIGER.

Lea & Febiger will exhibit among their new works Thorndike's "Manual of Bandaging, Strapping and Splinting," Wintrobe's "Clinical Hematology," Katz' "Electrocardiography and Exercises in Electrocardiographic Interpretation." New editions will be shown of Gray's "Anatomy," Thorndike's "Athletic Injuries," Lewin on "The Foot and Ankle," Kovács' "Electrotherapy and Physical Therapy for Nurses," Kessler's "Accidental Injuries," Comroe on "Arthritis" and Brahdy and Kahn on "Trauma and Disease."

LEPEL HIGH FREQUENCY LABORATORIES, INC.

Lepel invites you to visit their booth where they will have on exhibition their latest developments in short and ultra short wave diathermy equipment, ultraviolet lamps, low voltage generators, electrosurgery units. Continued service and cooperation on all Lepel equipment is assured to Lepel users.

THE LIEBEL-FLARSHEIM COMPANY.

Will display well-known L-F Short and Ultra-Short Wave Generators, featuring the new L-F Hinged Treatment Drum — the quickest, easiest and most effective treatment applicator available today. The famous Bovie Electrosurgical Unit also will be shown. In addition, there will be other newly developed and interesting physical therapy apparatus and accessories. It will be a pleasure to demonstrate this equipment to you.

MERCK & COMPANY, INC.

The display at the Merck booth will feature MECHOLYL CHLORIDE (acetyl-beta-methylcholine chloride). Mecholyl administered by the method of ion transfer (iontophoresis) is of service in the palliative treatment of chronic rheumatoid arthritis, and in the treatment of chronic ulcers, Raynaud's disease, scleroderma and vasospastic conditions of the extremities. Information regarding Mecholyl may be obtained at the Merck exhibit, where Mr. S. A. Gaffney will be in charge.

NATIONAL CARBON COMPANY, INC.

National Carbon Company, Inc., will display the various models of "National" Therapeutic Carbon Arc Lamps. A representative attending the exhibit will demonstrate the operation and application of this equipment.

PHILIP MORRIS & COMPANY.

Philip Morris & Company will demonstrate the method by which it was found that Philip Morris Cigarettes, in which diethylene glycol is used as the hygroscopic agent, are less irritating than other cigarettes. Their representative will be happy to discuss researches on this subject and problems on the physiologic effects of smoking.

THE SPENCER CORSET COMPANY, INC.

This exhibit presents moving photographic slides of actual case histories in which Spencer Supports were used for: hernia, visceroptosis with symptoms, postoperative, spinal conditions, maternity, breast problems and obesity. Illustrated explanations of Spencer Supports for movable kidney, sacroiliac and lumbosacral sprain, angina pectoris and other forms of heart disease, as well as for postpartum wear are included. Sample garments will be on display and trained attendants will be available to discuss the use of each.

TECA CORPORATION.

The Teca Corporation will show the latest development in medical hydro galvanic therapy. The Teca equipment may be utilized in conjunction with any existing bath tub, tank or combination of tanks. Teca therapy represents a new and highly efficient treatment, general as well as local, by means of two independently controllable circuits and the special Teca electrodes. Demonstration and complete information will gladly be given at the booth.

VITAMINERALS COMPANY.

Vitaminerals Company considers it a real pleasure to be with you again this year. Vitaminerals are ethical products of natural vitamins and minerals of unusual therapeutic value. See our new products and receive the latest up-to-the-minute information on vitamin, mineral, and other modern therapy at our exhibit at your convention.